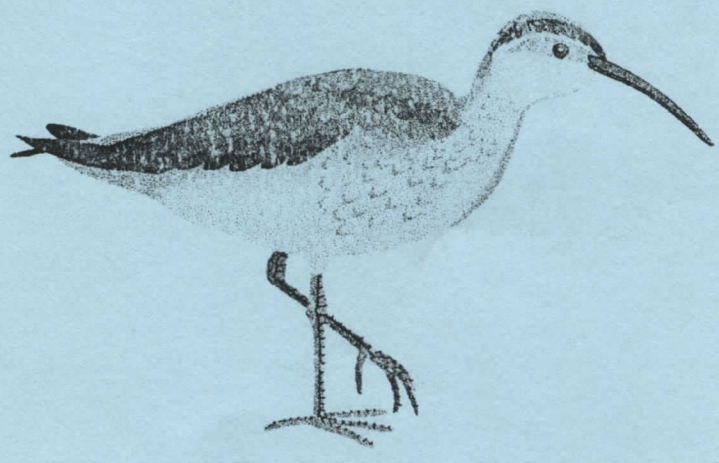
Double-O Habitat Management Plan

Malheur National Wildlife Refuge Oregon



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DOUBLE-0 HABITAT MANAGEMENT PLAN

Malheur National Wildlife Refuge

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Double-0 Habitat Management Plan
Executive Summary

The Double-0 Plan is a step-down plan of the 1985 Refuge Master Plan and Environmental Assessment. The purpose of this plan is to guide the management, protection, and restoration of habitat on the Double-0 Unit of the Malheur Refuge. Although this is a long-range plan , it will be evaluated after five years and will be updated as better management information is developed or to reflect changes in resource priorities.

This plan will focus on the goal of improving wildlife habitat at the Double-0 Unit. Major actions will include: 1) protection of sensitive habitats and sites such as Research Natural Areas and archaeological sites; 2) Haying, grazing and burning of meadow vegetation to enhance habitat for spring feeding and breeding activity for waterbirds and nesting shorebirds; 3) management of water supplies to provide additional late season brood water; 4) maintenance and enhancement of nesting cover in uplands, marshes, meadows and riparian areas; 5) elimination of interior fencing to reduce wildlife losses; 6) development of a grain field to provide a fall feeding and staging area for greater sandhill cranes; and 7) restoration of willow riparian zones that once existed downstream from the springheads and along Silver Creek.

Two issues which have a major influence on wildlife viability at Double-0 are addressed in this plan. These issues are 1) management of limited water supplies for the benefit of wildlife species and 2) management of vegetation to enhance habitat conditions for wildlife species. Other issues which have a direct impact on the habitat, specifically carp and predators, are covered in depth in other management plans.

Refuge land management practices will change with implementation of this plan. It will result in a reduction from 2400 to 1500 acres grazed. Areas to be managed by haying will increase from about 350 acres a year to 750. Areas to be managed using prescribed burning will increase from about 50 acres a year to an average of 700 acres a year. The remaining 15,600 acres of the Double-0 Unit will remain idle under this plan. The total estimated cost to enhance habitat under this plan is $115,000 over a five-year period.

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Appendices

Attached:

Unattached - available at refuge headquarters

I. INTRODUCTION

Malheur Refuge is managed by the U.S. Fish and Wildlife Service (Service) and is located in Harney County in the high desert of southeast Oregon. The nearest town, Burns, is located 32 miles northwest of refuge headquarters. The closest large cities are Bend, 170 miles to the west and Boise, Idaho, 200 miles to the east (Figure 1).

The refuge lies within the Pacific Flyway and provides valuable breeding, resting, and feeding habitat for waterfowl and waterbirds. Due to its location in the flyway, the refuge is an important stopover and nesting area for many migratory birds. It is situated in the Harney Basin at the northern edge of the Great Basin. Elevations range between 4085 and 4900 feet. The Silvies River Floodplain and Warm Springs Valley are areas of extensive privately owned wetlands which complement the refuge in this ecosystem.

Three major areas make up the 186,000 acre Malheur Refuge. The Blitzen Valley Unit, south of refuge headquarters contains 64,000 acres of irrigated meadows, dry uplands, and extensive riparian zones. The Lake Units, north of headquarters, encompass 102,000 acres and include Malheur, Mud, and Harney lakes. The Double-0 Unit, west of headquarters contains 18,800 acres of irrigated meadows, fresh and brackish marshes, brushy uplands, and alkali playas.

While the private wetlands in the basin are managed for hay and livestock production and primarily serve spring staging migrant ducks and geese, the Blitzen Valley and Double-0 Units are intensively managed for wildlife. Because of its brackish wetlands and invertebrate-rich waters, the Double-0 Unit is especially attractive to nesting shorebirds, ducks, and a wide variety of other marsh birds.

The purpose of this Double-0 Habitat Management Plan is to resolve resource problems and to enhance habitat conditions for migratory birds and other wildlife. This plan develops specific management strategies and is guided both by wildlife objectives and themes prescribed in the Malheur National Wildlife Refuge Master Plan (USFWS 1985), and current biological knowledge of the Double-0 Unit.

The Double-0 Unit extends northwest from the west shore of Harney Lake. The area includes about 8,900 acres of uplands and 9,900 acres of wetlands. The unit's wetlands include about 8,600 acres of irrigated meadow habitat, 1,200 acres of marsh and open water habitat, and only about 100 acres of woody riparian habitat.

Although the Double-0 area is dominated by alkali soils and may be considered marginal in terms of agricultural production, it is not marginal in its potential to support wetland wildlife. The brackish and freshwater wetlands of the Double-0 support higher densities of nesting shorebirds than any other unit of the refuge. The Double-0 also supports 15% of the refuge's sandhill crane pairs, accounting for about 8% of the cranes in the Central Valley Population. In wet years, the Double-0 supports higher densities of duck pairs per wetland acre than any other refuge unit. About 19% of the refuge's dabbling duck breeding habitat is contained within the unit. In years with good water, the Double-0 accounts for over 30% of the refuge's dabbling duck production.

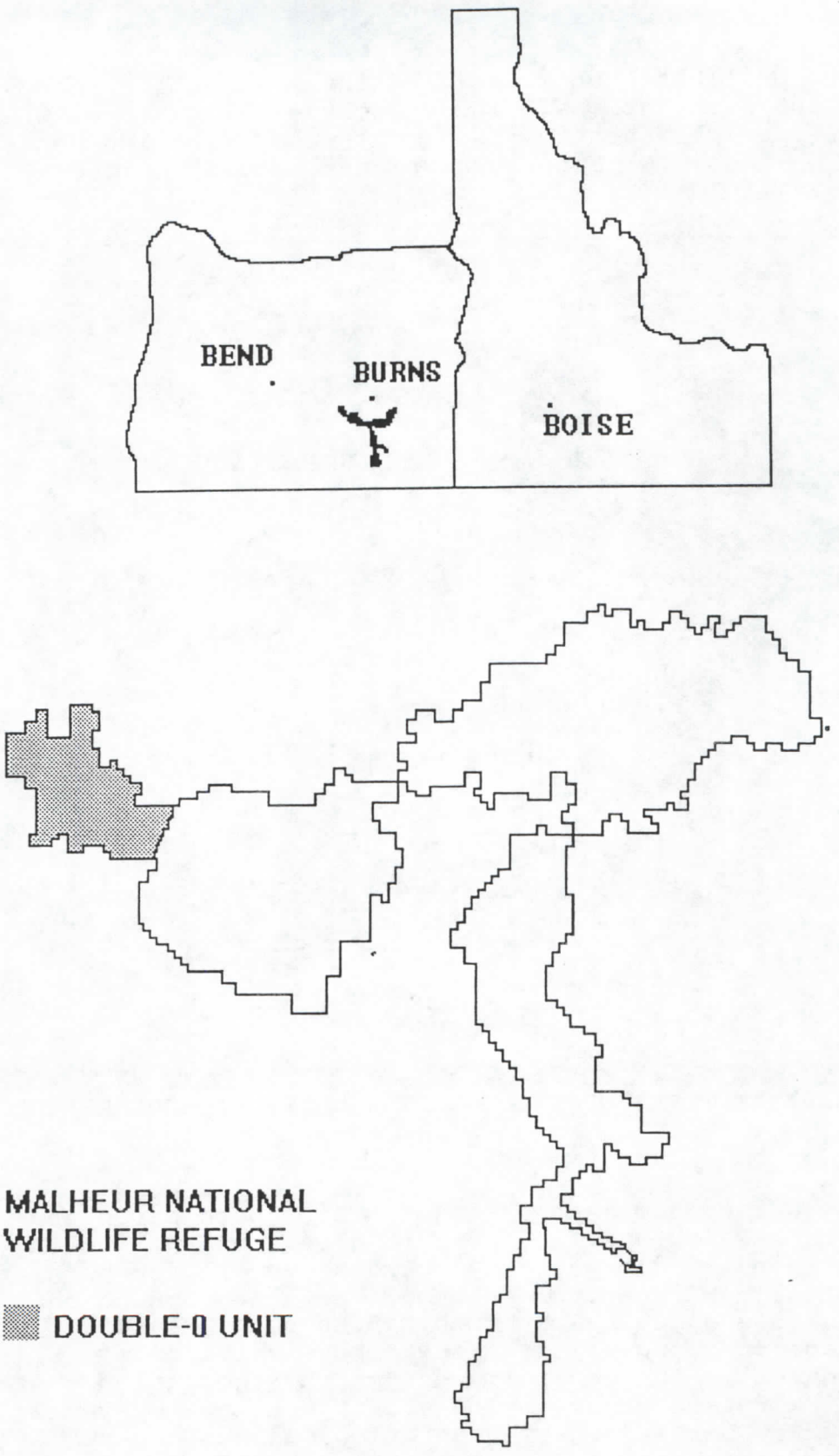


Figure 1. LOCATION MAP

The Double-0 Unit has been classified into six habitat complexes based on plant associations. These include (1) seasonal wet meadows; (2) semipermanent marshes; (3) woody riparian zones; (4) greasewood uplands; (5) sagebrush uplands; and 6) meadow-upland mix (Figure 2).

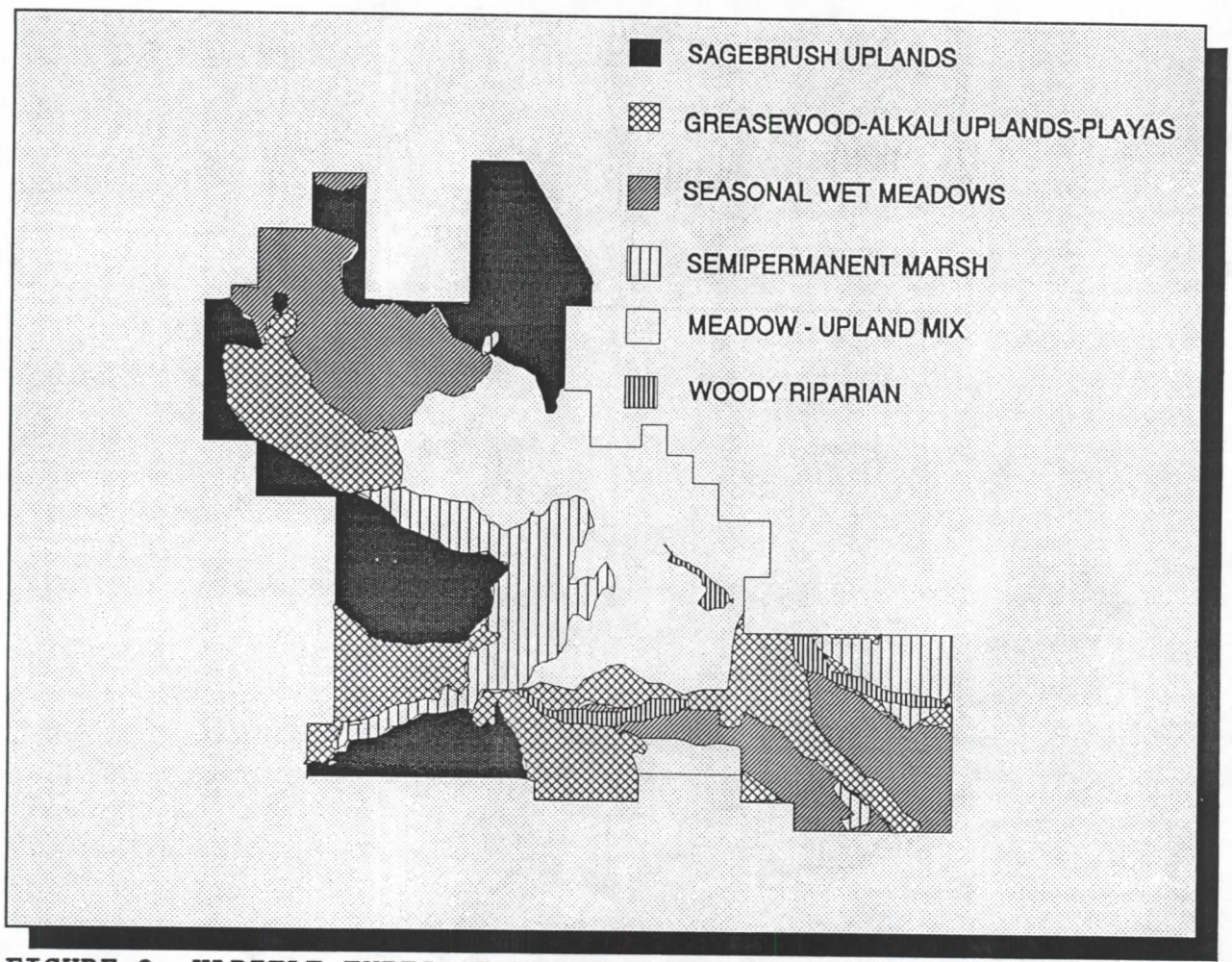


FIGURE 2. HABITAT TYPES OF THE DOUBLE-0 UNIT, MALHEUR REFUGE

The seasonal wet meadow association contains both marsh and meadow habitats which are flooded during part of the growing season. Marshes are dominated by emergent vegetation such as bulrush, cattail, burreed, and common reed. Meadows contain species such as sedges, baltic rush, spike rush, Nevada bluegrass, and creeping wildrye (see Appendix IV for a list of scientific names). The semipermanent marsh association contains wetlands which retain water during all or most of the year. These marshes support emergent vegetation, as well as submergent aquatic plants in open water areas. The woody riparian zone association is dominated by willows and often contains other woody species such as gooseberry and cottonwoods. This

association occurs along stream banks, and in some cases, along dikes and irrigation canals. The greasewood upland association is dominated by greasewood, saltgrass, and bare alkali playas. This complex also includes areas of sand dunes. The sagebrush upland association are those uplands dominated by big sagebrush and Great Basin wildrye.

The upland-meadow mix association are those areas where uplands are interspersed with wet meadows and the uplands constitute 20 to 60% of the area. Uplands in this complex are dominated by sagebrush or greasewood, depending on soil types.

A. A Brief History

The refuge was established by Executive Order of President Theodore Roosevelt in 1908 as an 81,786 acre "preserve and breeding ground for native birds" and was called the Lake Malheur Reservation. The 64,717 acre Blitzen Valley portion of the refuge was acquired in 1935 from the Eastern Oregon Land and Livestock Company under an Executive Order signed by President Franklin D. Roosevelt. The order specified that the lands were for use "as a refuge and breeding ground for migratory birds and other wildlife." The reservation was renamed the Malheur Migratory Bird Refuge. In 1940 the name was officially changed to the Malheur National Wildlife Refuge. The last major segment, 18,800 acres in the Double-0 Unit, was purchased from the William Hanley Company in 1941.

B. Mission, Direction and Policy

According to the Refuge Manual (RM), the mission of the National Wildlife Refuge System is "to provide, preserve, restore and manage a national network of lands and waters sufficient in size to meet society's needs for areas where the widest possible spectrum of benefits associated with wildlife and wildlands is enhanced and made available" (2 RM 1.3).

While the Double-0 Unit has no specific mission or establishing statement, it was purchased with funds from the Migratory Bird Conservation Commission. Lands purchased from these funds are intended to be managed for the protection of migratory birds and other wildlife. In addition, the Refuge Recreation Act of 1962 states that later additions to existing refuges take on the establishing statements or purposes of the original acquisition. In this case Malheur Refuge was originally established "as a refuge and breeding ground for migratory birds and other wildlife." Thus the above purpose will also guide management of the Double-0 Unit.

Refuge resource policy is derived from goals set forth for the National Wildlife Refuge System. The Refuge Manual contains policies for management of refuges and lists the following goals for refuges (2 RM 1.4 A-D):

a) To preserve, restore and enhance in their natural ecosystem (when practicable) all species of animals and plants that are endangered, or threatened with becoming endangered.

b) To perpetuate the migratory bird resource.

c) To preserve a natural diversity and abundance of fauna and flora on refuge lands.

d) To provide an understanding and appreciation of fish and wildlife ecology and man's role in his environment, and to provide refuge visitors with high quality, safe, wholesome, and enjoyable recreational experiences oriented toward wildlife to the extent these activities are compatible for the purposes for which the refuge was established.

The Refuge Master Plan provides management direction for each unit of the refuge by identifying important groups of wildlife to be emphasized for management. Wildlife activities emphasized in the Double-0 Unit includes shorebird, sandhill crane and dabbling duck production, and shorebird spring and fall use.

The Refuge Master Plan outlines a developmental management theme for the Double-0 Unit. According to this theme, artificial practices to provide wetland habitat for birds will be used, when appropriate, for the management of this unit. Because most of the Double-0 wetlands are maintained using an irrigation system, intensive management is necessary to maintain the area's high productivity.

A determination of compatibility is a statutory requirement that must be met before any activity will be permitted on a National Wildlife Refuge. According to the Refuge Manual, compatibility is defined as "a use that will not materially interfere with or detract from the purpose(s) for which the refuge was established." A compatible use may support a refuge purpose or it may be of a nonconflicting nature. Permitted refuge activities such as public use, haying and grazing must meet this compatibility standard. Under section 4 (d) of the National Wildlife Refuge Administration Act of 1966, (16 U.S.C. 668dd(d)), the refuge manager has the authority to regulate any activity on a National Wildlife Refuge other than prior existing right-of-ways or other prior agreements. The only legal requirement is that permitted activities must be compatible with the purpose for which the refuge was established.

C. Public Involvement

The following actions have been completed to insure participation and review by the general public as well as by other governmental agencies:

1. A four-page letter describing goals and objectives, a problem statement, and the basis for our management decisions was mailed to over 140 individuals and organizations in January 1993. Included with the letter was a comment form to be returned to the refuge. Approximately 40 responses were received from organizations and individuals.

2. A preliminary draft plan was put together in March 1993. That draft outlined the resource problems, wildlife species needs and habitat management themes proposed for the Double-0 Unit. The public was again invited to review and comment on the proposed plan. Fifteen responses were received in reply to this initial draft.

3. A public meeting was held on May 7-8, 1993 at Malheur Refuge. Twenty individuals representing a variety of interests participated in discussions concerning the proposed plan. These issues were incorporated into or addressed in the final draft.

4. On November 10, 1993, a final draft plan was mailed out to 40 individuals and organizations who expressed a prior interest in the plan. Fourteen letters commenting on the plan were received in response to the final draft. These comments are listed and addressed in Appendix I. Several of the suggestions have been incorporated into the plan.

5. Refuge haying and grazing permittees were officially informed of plan highlights in May, 1994. A meeting was held with them to discuss how major changes in this plan would affect them. At that time, they were given an opportunity to comment on the proposed changes.

II. RESOURCE CHALLENGES

Management in the Double-0 Unit involves two major challenges: 1) management of water to provide for wildlife needs and; 2) management of vegetation to provide for wildlife needs. Two other factors, carp and predators, also influence habitat quality but are addressed in other documents. Minimizing the negative impacts of carp on wetland habitat is covered in the annual water management plan and reducing the negative impacts of predators on migratory bird species is covered in the 1995 predator plan and environmental assessment.

A. Water Management

Water availability is the major factor limiting wildlife abundance at the Double-0 Unit. Wetland areas provide necessary feeding, resting, pairing and nesting sites for a wide variety of species. Two major water sources for wetlands are available: one from several large springs along the units southern edge, and the other from the Silver Creek drainage (Figure 3). A series of irrigation canals direct water to ponds and meadows. Water flows are relatively constant, and are used to irrigate fields and ponds within the south half of the unit. Spring water can also be directed to flood about 60% of the unit's wetlands.

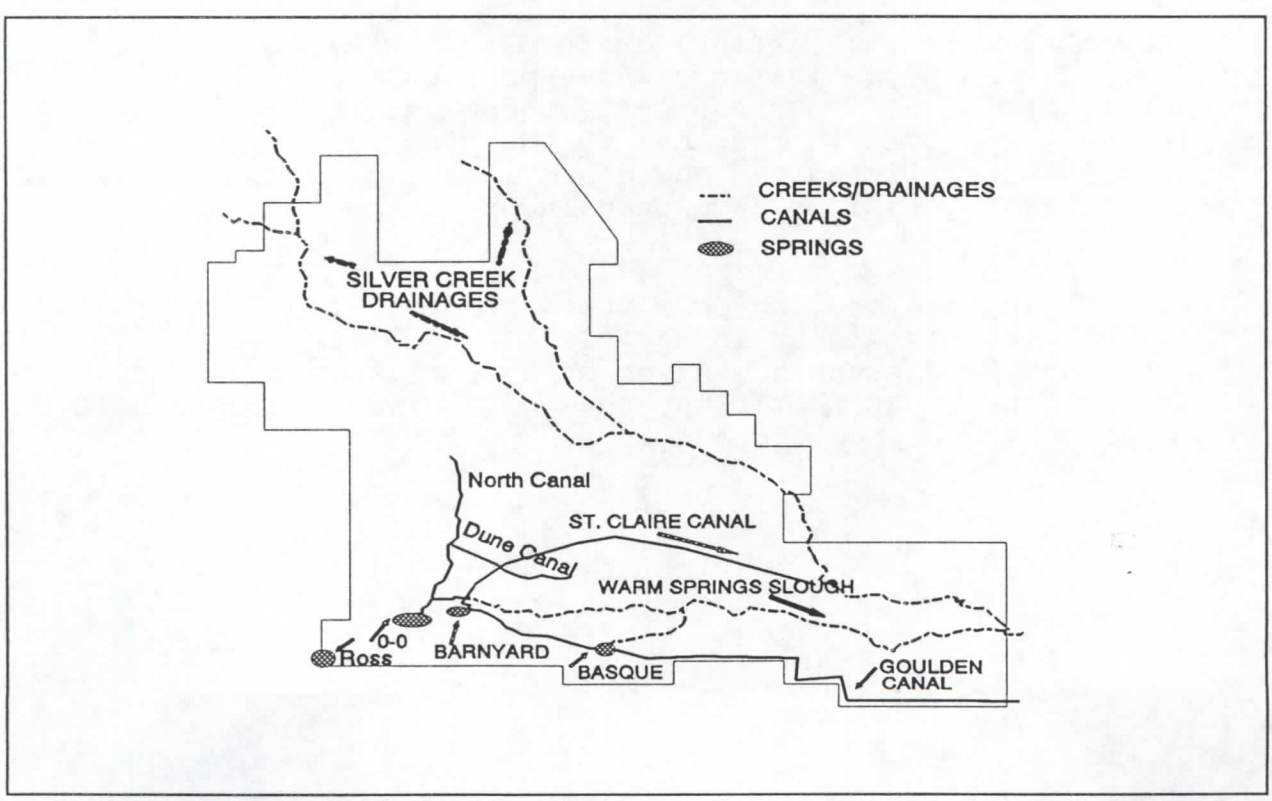


FIGURE 3. WATER MANAGEMENT SYSTEM, DOUBLE-0 UNIT, MALHEUR REFUGE

Water supplies from Silver Creek are much less reliable. The unit has received water from Silver Creek only once in the past five years. Silver Creek water only reaches the Double-0 Unit when snowpack in the drainage is at least 80% of normal. Silver Creek primarily provides water to the north half of the unit. When Silver Creek water is not available, management options are severely limited.

B. Vegetation Management

Active management of vegetation is crucial if the refuge is to meet the needs of wildlife. In the past, a variety of tools have been used to meet these needs including water manipulation, prescribed burning, livestock grazing, haying, grain farming, mechanical manipulation of vegetation, and noxious weed control. Marsh and meadow habitat have historically been the focus of vegetative manipulation on the refuge. Sensitive sites such as Stinking Lake Research Natural Area, uplands, riparian areas, and sand dunes have suffered resource damage caused by humans, livestock, and other factors. Protection and enhancement of these sites will be a priority under this plan.

Noxious weeds are a problem on portions of the Double-0 Unit. The predominant plants include perennial pepperweed, whitetop and Canadian thistle. Figure 4 shows areas of pepperweed infestation. Recent guidance from the Service limits the types of herbicides which can be used and how they can be applied. This philosophy of reduced herbicide use can be expected to continue into the foreseeable future, therefore other means of reducing noxious weed problems will be applied.

During the recent drought of 1986-1992, pepperweed invaded disturbed riparian, meadow and irrigation ditch sites in the northern portion of the Double-0 Unit. Pepperweed forms dense stands and excludes or severely limits production of other plants in an area. Although wildlife species have been found to use or nest in pepperweed, no wildlife food value has been attributed to the plant. In some disturbed sites, noxious weeds eliminate beneficial native plants, thereby reducing diversity of the ecosystem.

Canadian thistle has been a problem for many years on the refuge. It invades disturbed sites such as ditch banks and roadsides and then spreads to dry meadows. It can form dense stands but is more often found interspersed with meadow grasses.

Whitetop is prevalent in the grain field at the Double-0. The planned control method for this weed is annual discing of the field.

Riparian sites are small and severely degraded in the Double-0 Unit. The available historical information suggests that before widespread livestock grazing, the area supported a vigorous riparian system.

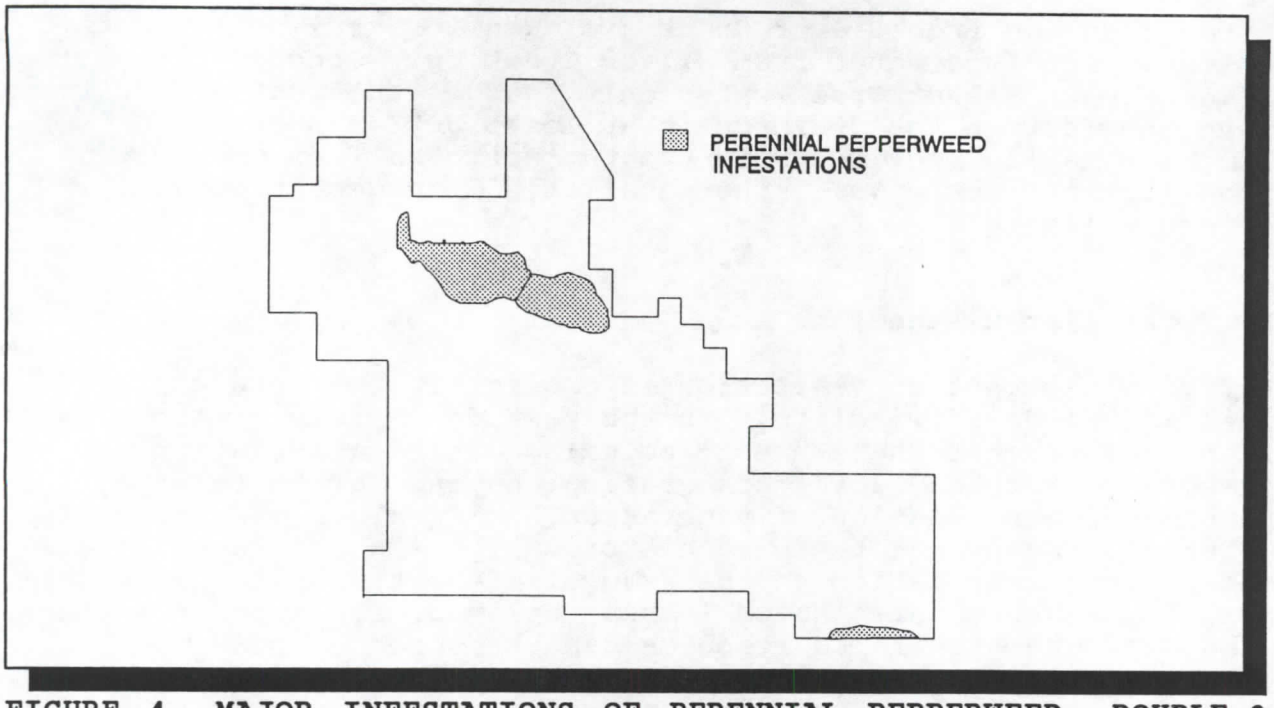


FIGURE 4. MAJOR INFESTATIONS OF PERENNIAL PEPPERWEED, DOUBLE-0 UNIT, MALHEUR REFUGE

Problems common to other riparian zones are evident at the Double-0 and extend northward upstream to the Ochoco National Forest Boundary. Steep cutbanks, siltation, unstable streambanks, lowered water tables, and reduced late summer stream flows are all symptoms of past abuses to the area. Spring snow melt which flows out of the Blue Mountains into the Silver Creek Drainage enters the refuge in the northwest corner of the Double-0 Unit. During years with heavy snowpack, water moves swiftly, causing widespread flooding and streambank damage because of degraded riparian and adjacent upland habitat. During years with low snowpack, little, if any, water reaches the refuge, which results in dry creekbeds and wetlands.

III. WILDLIFE MANAGEMENT STRATEGIES

Wildlife to be emphasized in management of Double-0 habitats include nesting and migrating shorebirds, sandhill cranes and ducks. Although these are not the only species which will benefit from management of the unit, they are priority species, as prescribed by the refuge's Master Plan. By serving their needs, the needs of other wetland wildlife will also be met. Figures 5, 6 and 7 show important areas in the unit for these wildlife species. The needs of these species are described in detail in Appendix 2. The strategies to provide for the basic needs of shorebirds, cranes and ducks in relation to management of the Double-0, are described in this section.

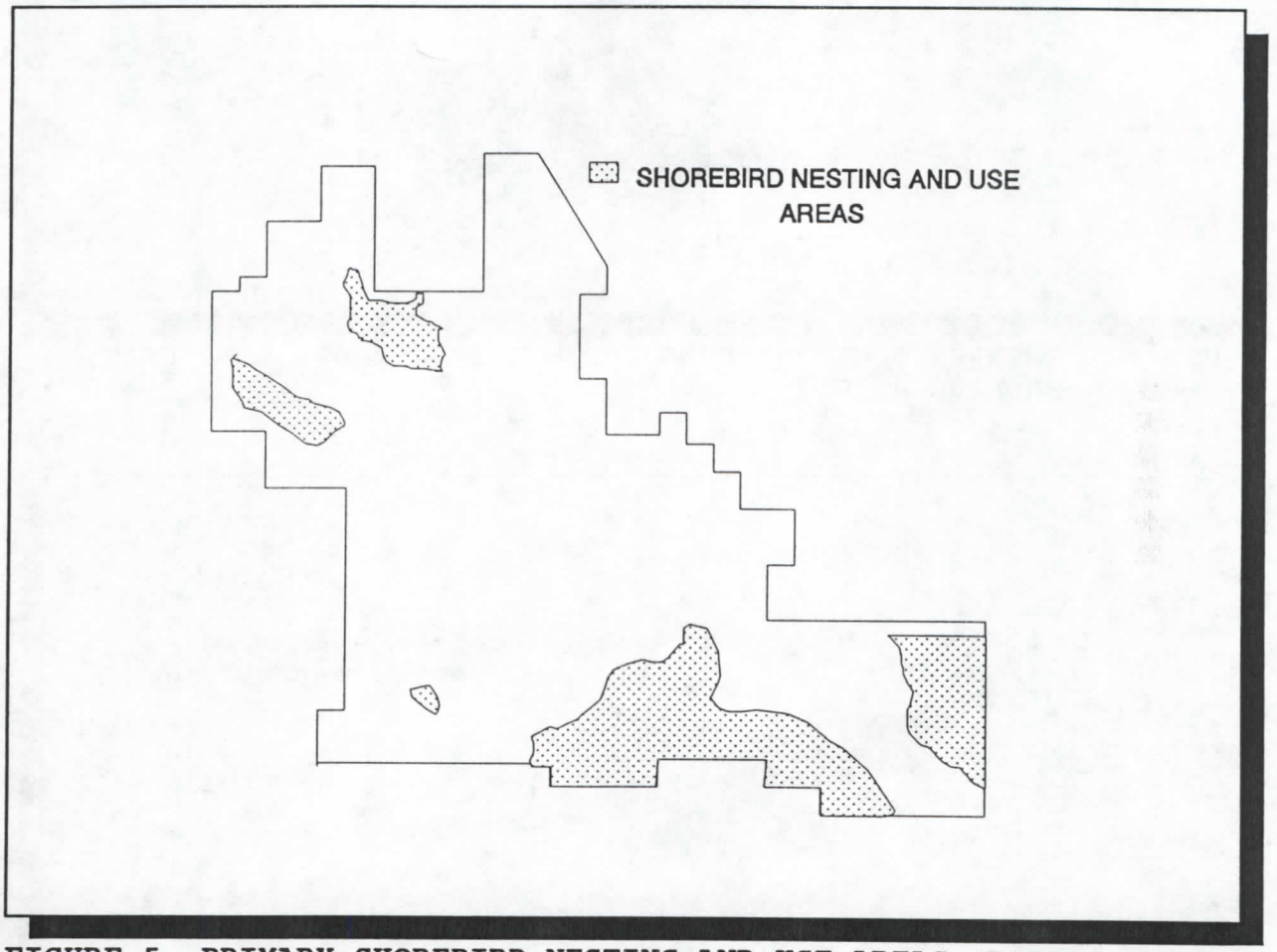


FIGURE 5. PRIMARY SHOREBIRD NESTING AND USE AREAS, DOUBLE-0 UNIT, MALHEUR REFUGE

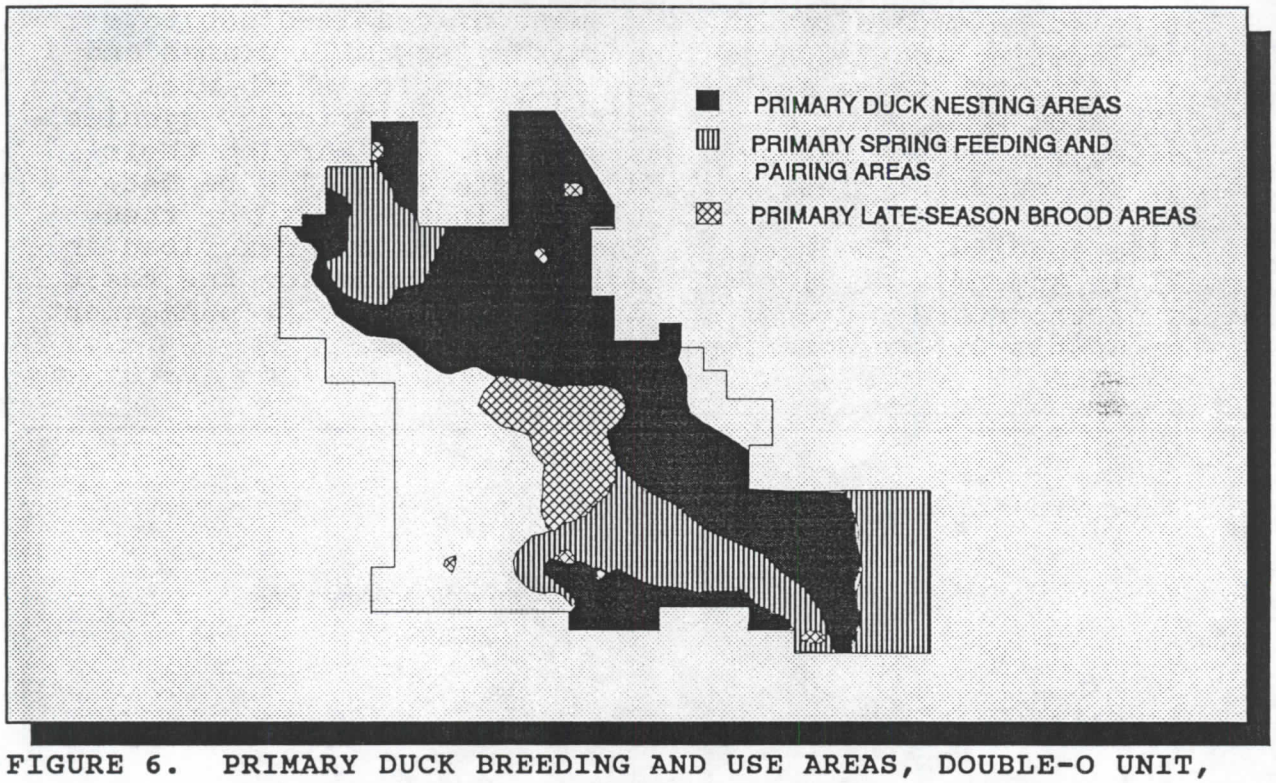


FIGURE 6. PRIMARY DUCK BREEDING AND USE AREAS, DOUBLE-O UNIT, MALHEUR REFUGE

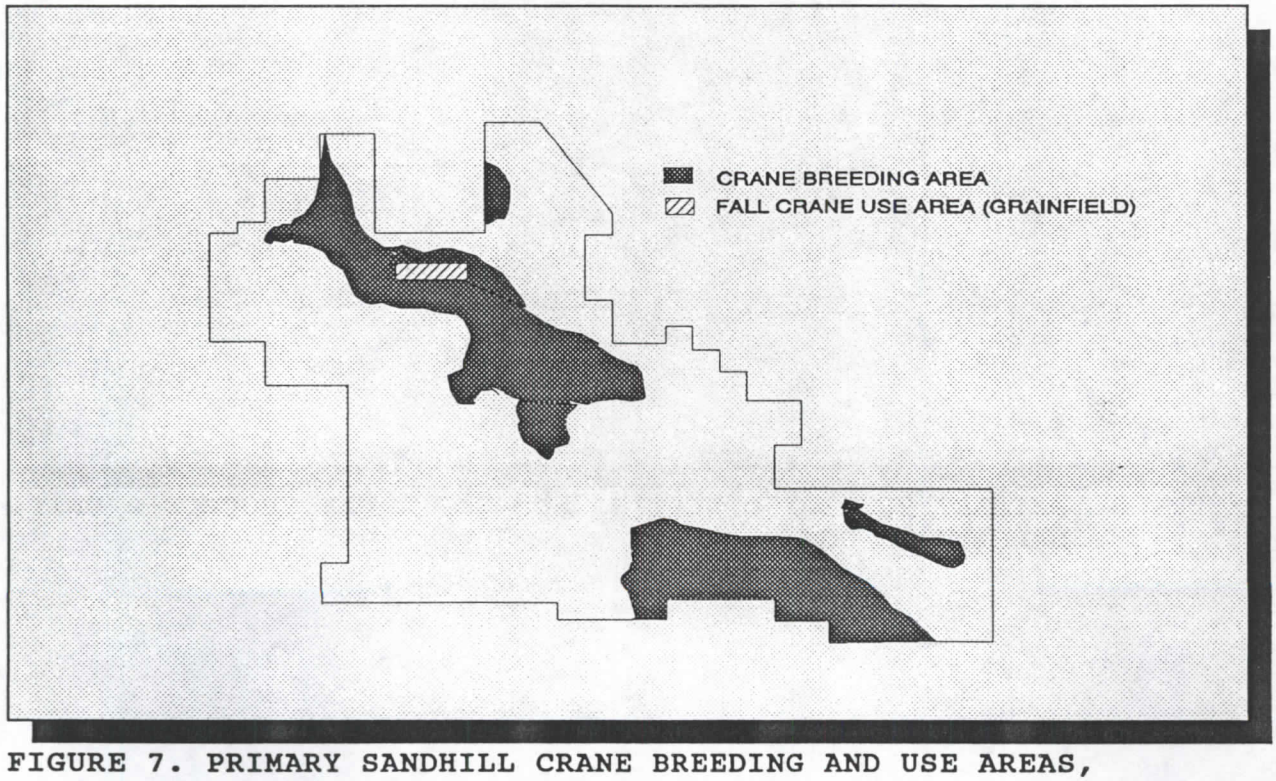


FIGURE 7. PRIMARY SANDHILL CRANE BREEDING AND USE AREAS, DOUBLE-O UNIT, MALHEUR REFUGE

A. SHOREBIRD MANAGEMENT STRATEGIES

Shorebirds need both shallow water and open areas with low cover. To meet the low cover preference of nesting shorebirds, short-grass meadow areas should be treated by burning, grazing, or haying. Nesting islands can be constructed to provide additional nesting sites. These islands should be barren and graveled to increase their attractiveness to shorebirds. To provide habitat for migrating shorebirds, water management should include fall flooding of certain areas one month before freeze-up to allow aquatic invertebrate populations to develop, followed by partial spring drawdowns to make invertebrates available to spring migrants. For summer-fall migrants, water management needs to include wetland drawdowns to make aquatic invertebrates available, and flooding of some new areas in mid-June, 2-3 weeks before shorebirds arrive.

B. CRANE MANAGEMENT STRATEGIES

For breeding sandhill cranes, irrigation should begin in meadows and marshes in early February, and all breeding territories should be wet by mid-April. Dense emergent marsh vegetation needs to be provided to conceal nests from predators. Water should be widely distributed throughout all crane habitat to minimize territorial conflicts. Water level fluctuations should be minimized during the nesting season to prevent flooding or drying of nests sites. If possible, some water should be maintained in crane breeding areas through August.

To encourage early nesting and to provide high protein feeding sites, meadow areas can be treated using burning, haying, or rake-bunch grazing within crane territories. The advantages of early nesting include greater chances of renesting if eggs are lost, avoidance of problems with water shortages for broods, avoidance of increasing coyote activity in late summer, and more time to grow and gain strength for migration.

To minimize risks to young cranes, the standard date when permittees are allowed to cut hay should be August 10, however, haying can be delayed until later in areas where unfledged crane colts are known to occur.

Mixed crops totalling about 100 acres of grain should be planted for fall sandhill crane use. Crops to be planted can include cereal rye, spring barley and winter wheat.

C. DUCK MANAGEMENT STRATEGIES

For breeding ducks, spring irrigation water should be applied in February to permanent and seasonal wetlands, including meadows. To ensure that adequate wetland habitat is available to attract duck pairs to the unit, some areas need to be flooded and maintained through the fall and winter.

About 50% of the meadow area should be treated using prescribed burning, haying and grazing to provide early season feeding areas for migrating and breeding ducks, cranes, and geese, and to enhance certain areas for shorebird nesting. These birds utilize high protein foods in flooded treated meadows to condition their bodies for both egg laying and the energy demands of breeding and nesting. To discourage birds from nesting in wetter areas of meadows and avoid loss of nests to flooding, these areas need to be treated to remove cover. The remaining 50% of the meadow habitat should be left idle to serve as nesting habitat. This area plus idle uplands will support nesting birds in the Double-0 Unit.

Sagebrush and greasewood upland sites need to be under idle management to provide good nesting cover for mallards, gadwalls and other upland nesters. Sagebrush sites should be periodically burned to enhance cover by invigorating grasses such as Great Basin wildrye. About 50% of the meadow area is managed as idle for meadow nesting ducks such as cinnamon teal. Large cover blocks of 50-100 acres can be maintained to ensure higher nest success. Dense emergent areas greater than one-acre should be maintained within seasonal and semipermanent marshes for over-water nesting ducks such as redheads. In hay-only areas, a buffer strip of meadow of about 10 meters needs to be left adjacent to upland and riparian habitats.

For duck broods, selected wetlands should be maintained as semi-permanent marshes, with water held through early October when possible.

D. OTHER WILDLIFE MANAGEMENT STRATEGIES

Many other wildlife species depend on the Double-0 Unit during the breeding season and during migration. Managing habitat for cranes, ducks, and shorebirds will also provide adequate habitat to meet the needs of a large variety of waterbirds. Enhancement of woody riparian and upland habitats should increase the use of these habitats by a greater variety of birds.

Currently, sizeable nesting colonies of double-crested cormorants, great blue herons and great egrets are located in dead standing willows along the Goulden Canal near Harney Lake. Protection of this colony site will remain an important priority in this plan.

One feature unique to the Double-O Unit is its use by large numbers of migrant spring waterfowl. White geese and Ross' geese, migrating cranes and ducks use treated (grazed, hayed or burned) irrigated meadows in March and April. This area is very important to these species during dry years, because little feeding habitat is available elsewhere in the basin. Poor food conditions during spring migration can lead to stress, especially in white geese, resulting in high mortality from avian cholera. The reliability of spring water in the lower fields consistently provides good flooded meadow feeding habitat.

IV. HABITAT GOALS

Goals for the Double-0 refuge habitat program are identified below by habitat type. These goals are used when monitoring habitats in order to determine effectiveness of management actions.

A. Upland Goal

The upland goal for the Double-0 Unit is to eliminate livestock impacts from the uplands and have 90% of uplands at their potential for producing nesting cover. In the early 1970's, the vast majority of upland acreage in the Double-0 Unit was grazed from mid-July until early April. At that time less than 5% of the Double-0 uplands were in good condition. In 1994, over 70% of uplands were at their potential for providing quality nesting cover. While this was a significant improvement, cattle were still having an impact in some areas on upland nesting cover and upland condition.

B. Seasonal Wet Meadow Goal

The goal for seasonal wet meadows in the Double-0 Unit is to have 50% in an idle condition for nesting cover with the remaining 50% managed for spring feeding sites through removal of meadow grass. An additional goal is to reduce by 25% the acreage of emergent vegetation which has invaded the meadows in the south portion of the Double-O. During peak cattle grazing in the early 1970's, less than 5% of the 8600 acres of meadow in the Double-0 Unit remained idle. By 1994, the amount of idle meadow had increased to just over 50%, greatly increasing the amount and quality of meadow nesting cover. Although the goal for treated versus idle meadow has been met, changes are needed in management of water on meadows to discourage continued encroachment of decadent marsh vegetation into the meadows.

C. Semipermanent Marsh Goal

The goal for Semipermanent marsh habitat in the Double-0 Unit is to have 50% as open-water habitat and to have all semipermanent marsh areas as productive as possible. Of the 200 acres of marsh at the Double-0 in 1994, almost 50% were in an open-water condition attractive to some waterfowl and waterbirds. While some additional open-water marsh is needed, we are near our management objective for these areas. To increase productivity of the semipermanent marshes, removal of carp needs to be undertaken.

D. Woody Riparian Zone Goal

The goal for woody riparian sites is to increase the amount of woody riparian habitat by 25% over the next five years. Past grazing practices and eradication of willows and other woody riparian vegetation to create hay meadows has resulted in the elimination of most of this habitat within the Double-0 Unit. Even though riparian sites have been left idle in recent years, historical grazing and other impacts have all but eliminated riparian vegetation from the Unit. About 48 acres are currently designated as riparian habitat on the Unit. Increases in both quality and quantity of riparian habitat will occur only by active management, such as willow planting and rock check structure construction.

E. Cropland Goal

The goal is to maintain the 100 acres in grain crops. Grain farming at Double-0 is necessary to provide fall feeding habitat for migrating sandhill cranes. Approximately 100 acres are planned for this area and may include cereal rye, barley, and wheat.

F. Noxious Weed Goal

The goal is to complete a research project to learn practical control techniques for perennial pepperweed. With that information, an added goal is to reduce noxious weed infestations by 25% during the next five years, and to prevent any new infestations of noxious weeds.

V. HABITAT MANAGEMENT ALTERNATIVES CONSIDERED

Habitat management tools such as livestock grazing, haying and prescribed burning can be used to enhance habitat for refuge birds and other wildlife to help meet our habitat goals. If poorly managed, these tools can seriously degrade important riparian, upland, and wetland values. Figure 8 shows recent land management in the Double-0 Unit.

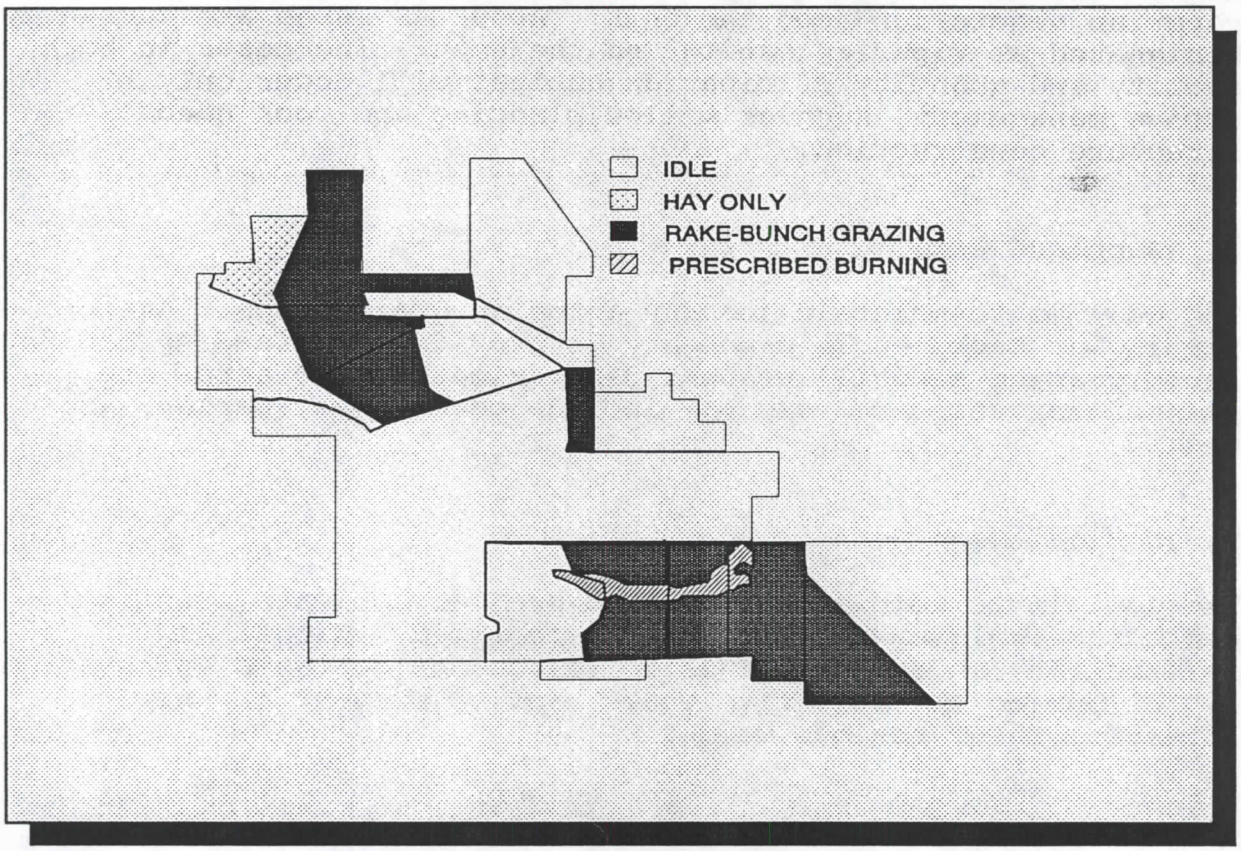


FIGURE 8. LAND MANAGEMENT OF THE DOUBLE-O UNIT, MALHEUR REFUGE IN RECENT YEARS.

Several alternatives for habitat management in the Double-0 Unit were considered, but not selected in this final plan. These included an "all idle" alternative, an "idle and burning" alternative, a "no burning" alternative, a "no grazing" alternative, and a "no haying" alternative.

An all idle alternative failed to provide treated wet meadow habitats for spring feeding use by waterfowl, shorebirds and other waterbirds.

The idle and burning alternative was not chosen because it would be difficult and expensive to burn 3000 acres of wet meadow habitat each year. Annual burning of the same areas would result in significant loss of nitrogen over time, lowering the productivity and value of the meadows to wildlife.

The no burning alternative was not selected because fire is a natural process which can't be duplicated by haying or grazing treatments. Cattle will not eat dense emergent growth during the dormant season and this habitat is difficult to mow. Grazing generally leads to increased brush on uplands, while burning leads to increased grasses. Generally, grasses provide better nesting cover for ducks and other ground nesting species.

The no grazing alternative was not selected because grazed meadow habitats are very attractive to birds in early spring, and because cattle recycle some nutrients in grazed fields through their excrement. Although haying has similar effects, this tool removes a greater degree of nutrients from the refuge meadows.

The no haying alternative was not selected because haying provides good spring feeding sites for birds and can be a very selective tool. Hay-only provides treated meadow areas adjacent to sensitive upland and riparian habitats without damaging those non-target habitats.

The preferred alternative includes limited use of livestock grazing, haying, burning and extensive idle habitat (Figure 9.)

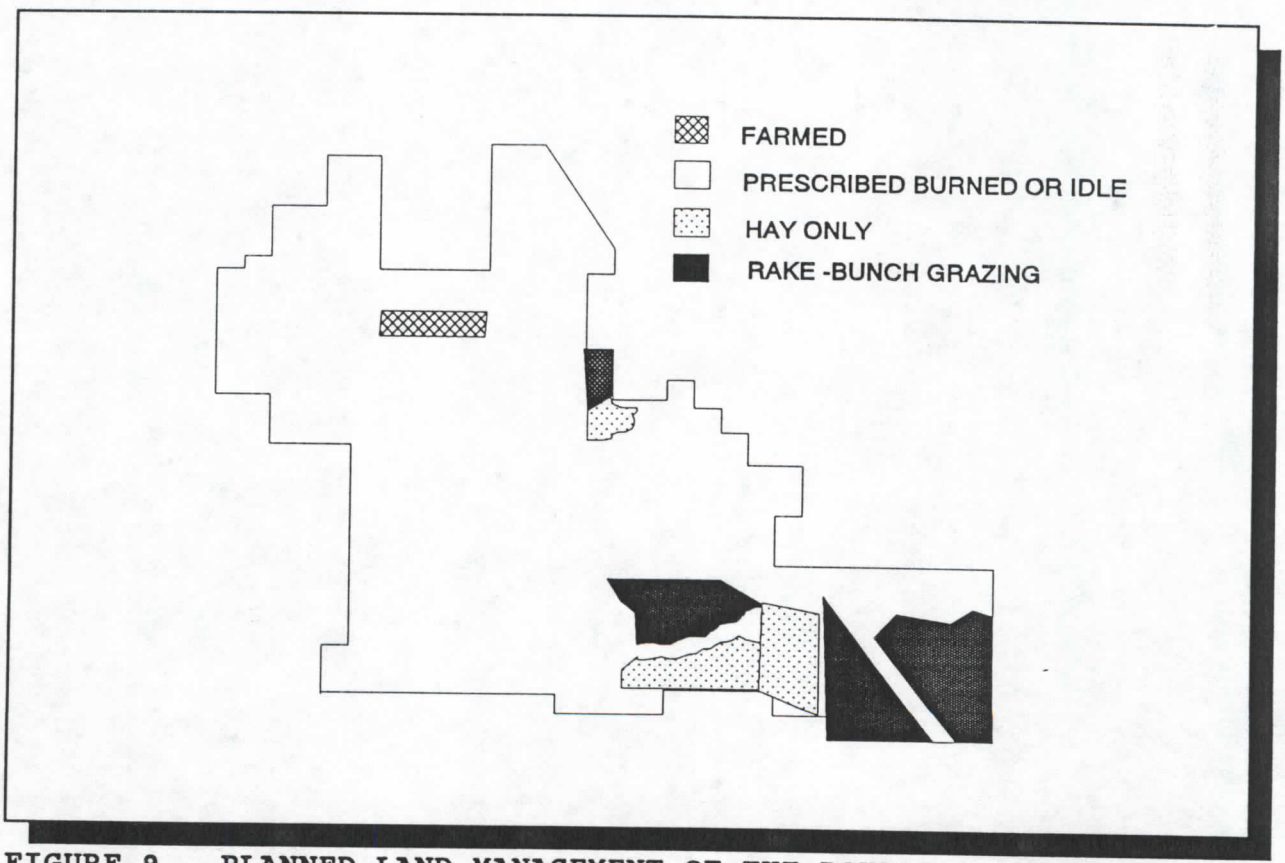


FIGURE 9. PLANNED LAND MANAGEMENT OF THE DOUBLE-0 UNIT, MALHEUR REFUGE.

This alternative will provide the mosaic of habitats required by wildlife using the Double-0 Unit. The diversity of habitat will provide sites for nesting, feeding, pairing and brooding of target species. Other wildlife, such as raptors, will do well in idle areas, and many songbirds will benefit from increased riparian habitat. Overall species diversity would be expected to increase, especially in riparian areas. Table 1 shows the different refuge habitat complexes and how they fit into the preferred management alternative for the various Double-0 habitats.

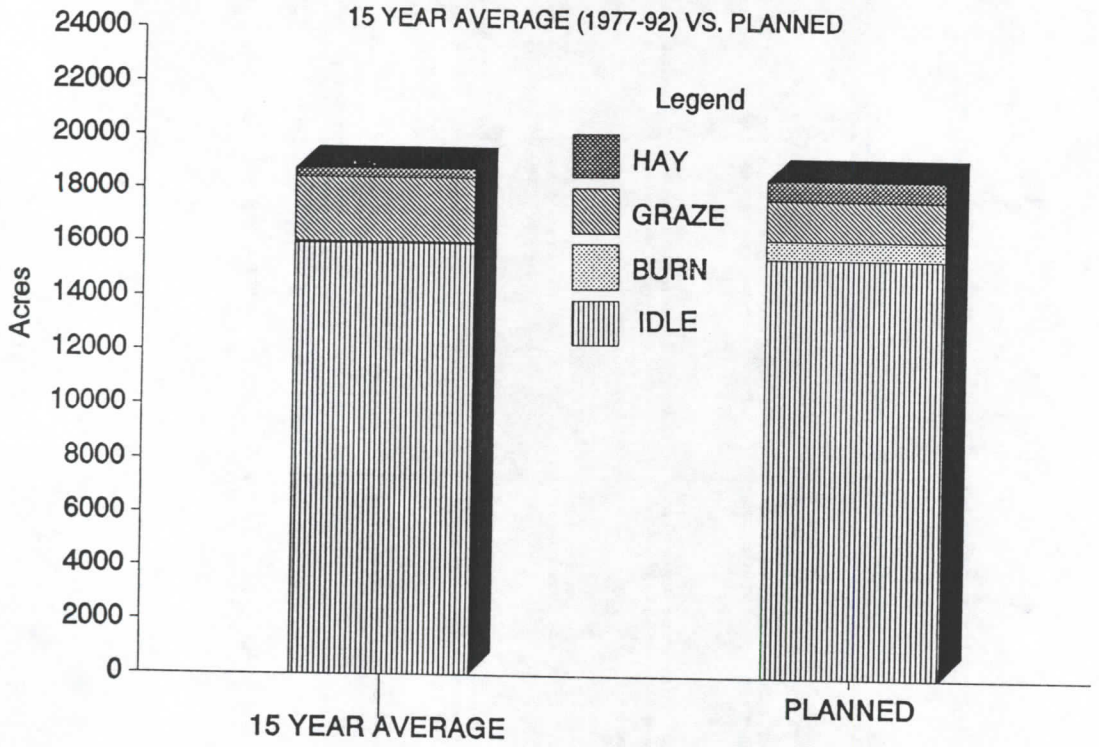
Table 1. Habitat complexes and their management strategies for the Double-O Habitat Management Plan, Malheur Refuge.

	SEASONAL WETLANDS	SEMIPERMANENT WETLANDS	GREASEWOOD UPLANDS	SAGEBRUSH UPLANDS	UPLAND-WETLAND MIX	WOODY RIPARIAN
DESCRIPTION OF COMPLEX	Contains interspersed marsh and meadow habitat, flooded seasonally.	Contains marsh habitat flooded most or all year.	Contains uplands dominated by greasewood, saltgrass, bare alkali playas and sand dunes.	Contains uplands dominated by sagebrush and Great Basin wildrye.	Contains wetlands mixed with wet meadows. Uplands comprise 20-60% of the area.	Contains woody vegetation along streams, rivers, and canals
UPLAND STRATEGY	Eliminate grazing impacts by fencing, use haying or burning or idle where not practical.	No significant areas of uplands found in this complex.	Idle strategy will dominate.	Idle strategy will dominate. Burn about 100 acres per year.	Idle strategy will dominate.	Idle strategy will dominate.
MEADOW STRATEGY	Grazing or Haying of 50 %. Idle 50%.	No significant areas of meadow found in this complex.	Idle strategy will dominate.	Idle strategy will dominate.	Hay or burn half of meadow areas.	Idle strategy dominate.
MARSH STRATEGY	Burning and mechanical strategy used with water management.	Burning and mechanical strategy used with water management.	No significant areas of marsh found in this complex.	No significant areas of marsh found in this complex.	Burning and mechanical strategy used with water management.	Water management strategy will dominate.
RIPARIAN STRATEGY	Idle strategy will dominate.	Idle strategy will dominate.	No significant areas of riparian found in this complex.	No significant areas of riparian found in this complex.	Idle strategy will dominate.	Idle strategy will dominate.

VI. PLANNED ACTIONS

A summary of our planned management actions are described below. Figure 10 shows treatment types by number of acres to be managed as idle, grazed, hayed and burned by prescription in this plan compared to past treatments. Under this plan, about 15,538 acres will remain idle, 1500 acres will be hayed and grazed, 750 acres will be hay-only, and 700 acres would be burned by prescription.

FIGURE 10. HABITAT MANAGEMENT TREATMENTS, IN ACRES, DOUBLE-0 UNIT
15 YEAR AVERAGE (1977-92) VS. PLANNED



A. Managing Vegetation With Water

A water management plan which is responsive to annual fluctuations in the water supply is prepared annually for the Double-0 Unit. This plan provides guidance and priorities for irrigation of meadows, and filling and draining of ponds, as well as indicating necessary repairs to the water management system.

During wet years when enough precipitation falls to allow Silver Creek to reach the Double-0, meadows and marshes in the north unit will be irrigated in the spring. About 20% of the meadows will be managed by haying, or burning. Burning by prescription will be undertaken in late winter only when enough water is available to assure flooding of burned fields. Fall haying will be undertaken only when hay fields are adequately flooded the prior spring.

Meadows and marshes in the south unit will be irrigated as early as possible in the spring and will be kept wet as long as possible into the summer. Some fields will be reflooded in early fall to provide wet meadow habitat for fall migrating birds. Planned treatments for the south end meadows should not be significantly affected by drought cycles as they are irrigated by spring water. Approximately 70% of these meadows will be managed by haying, grazing or burning.

Where possible, water levels in seasonal wet meadows will be manipulated to discourage encroachment of marsh habitat into the meadow zones. This is especially important in the south unit where there are significant areas of decadent marsh within seasonal wet meadow zones.

B. Managing Vegetation With Grazing and Haying

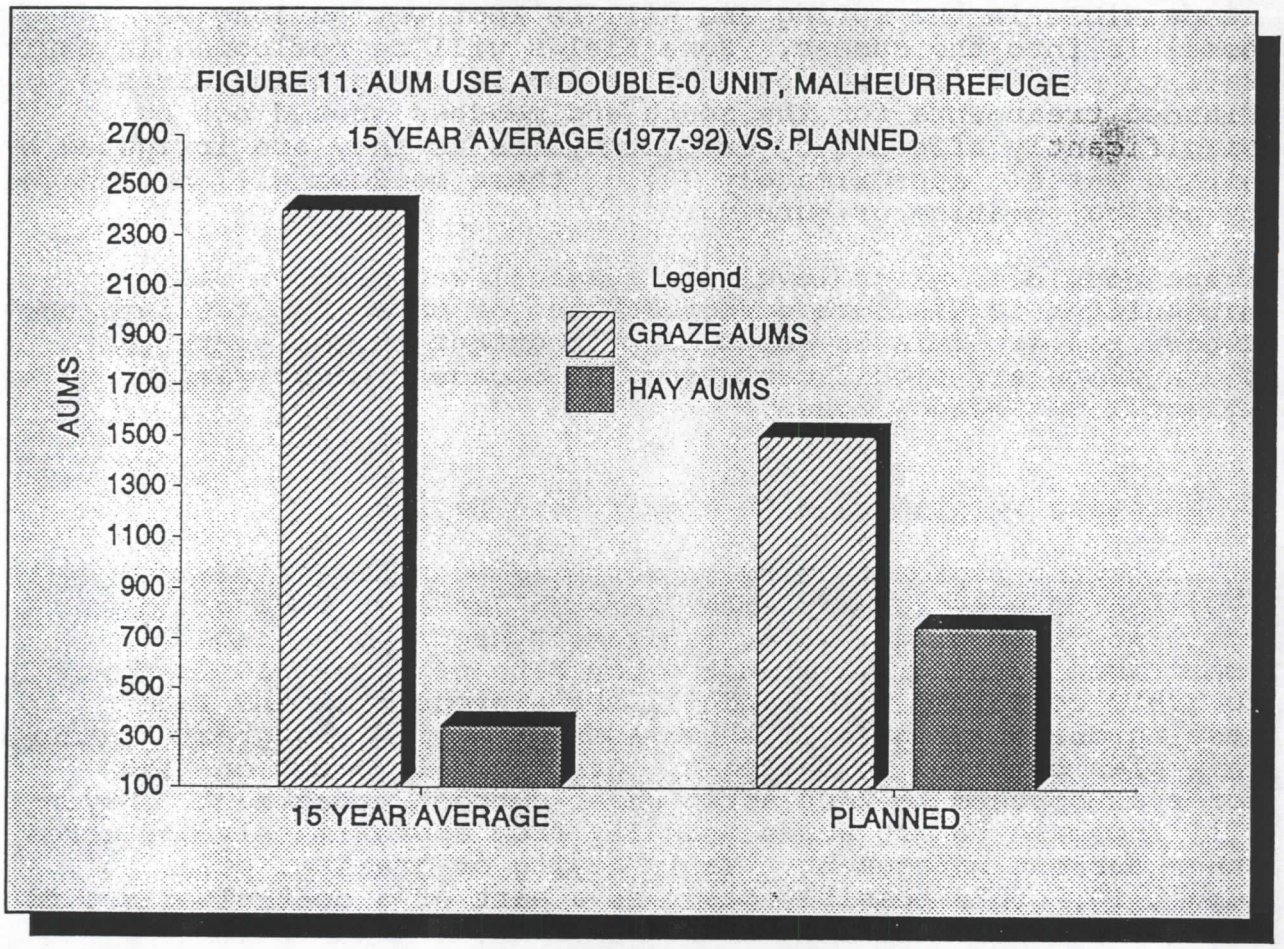
Only dormant season grazing on wet meadows sites is planned, with a period of use from September through January, to avoid direct conflicts with birds, water management needs, and plans for prescribed burning. A standard hay date of August 10 is planned to avoid conflicts with sandhill crane production and late nesting ducks. Figure 11 shows AUMs of haying and grazing under this plan compared to the past. Grazing will occur on 1500 acres as opposed to 2400 acres under current management. Haying will increase to 750 acres annually from approximately 350 acres under current management. Early haying or grazing, prior to August 10, could possibly occur as a part of a control effort for noxious weeds.

Overall, 8% of the area within the Double-0 Unit will be managed using livestock grazing and 5% will be managed using haying. Sensitive areas such as uplands, riparian zones and archeological sites would receive no grazing. Figure 12 shows habitat types to be grazed by livestock under this plan in comparison to the past. Meadows requiring treatments but surrounded by sensitive areas will be converted to hay-only or burned by prescription.

Total semipermanent marsh habitat at the Double-0 is about 200 acres. Marsh acreage affected by grazing under this plan will be reduced by approximately 50%. Several marsh areas are overgrown with emergent vegetation and support little open water. Because fall and winter livestock grazing is of limited use in opening up dense emergent marshes, other management strategies such as burning and mechanical manipulation will have to be employed.

Water level manipulation is another strategy that will be used to improve and increase grass cover.

Any hazards to wildlife including facilities used to manage the grazing program will be phased out. This includes items such as stack yards, watergaps, above ground powerlines for stock wells, and permanent interior fences. To eliminate conflicts with water management, each grazing unit will have an independent water source (well).

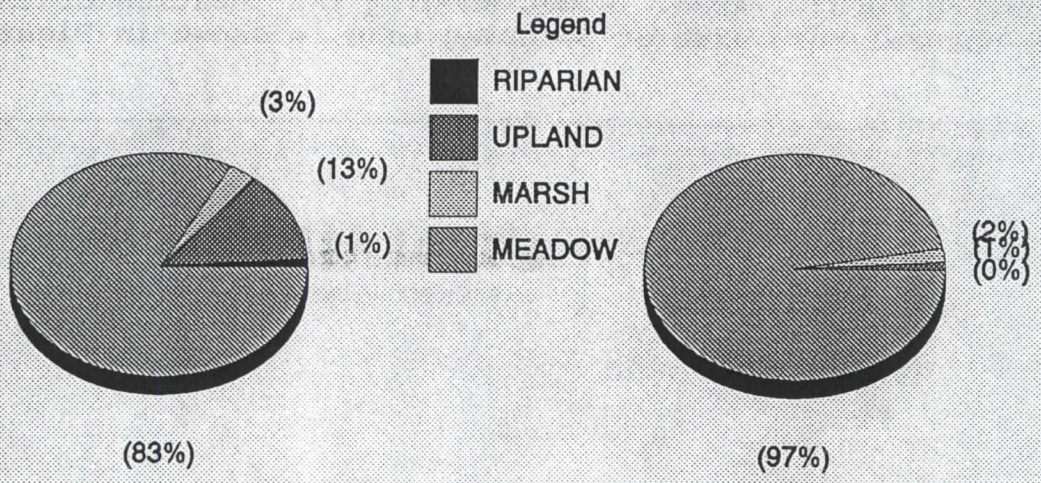


C. Managing Vegetation With Mechanical Manipulation

Discing will be used to reduce emergent vegetation in semipermanent marsh sites on a limited basis after the marsh sites are burned. Marsh vegetation will be disced in selected areas to provide additional open water areas and promote a 50:50 ratio of vegetated marsh to open water. To assist with control of noxious weed infestations, mowing of vegetation will also take place along roadsides and in selected fields.

FIGURE 12. HABITAT TYPES TO BE GRAZED AT DOUBLE-0 UNIT, MALHEUR REFUGE

15 YEAR AVERAGE (1977-92) VS. PLANNED



D. Managing Vegetation With Prescribed Burning

Prescribed fire will be used in areas where it is the most appropriate tool to achieve habitat goals. An average of about 700 acres a year will be burned by prescription in the Double-0 Unit, compared to an average of 50 acres a year in recent years. Prescribed burns will generally be conducted in the late winter at the Double-0 after the refuge has an estimate on potential spring runoff. If drought conditions are likely, there will be no prescribed burns.

About 500 acres of short-grass meadow area will be burned each year to enhance habitat for nesting shorebirds. An average of 100 acres of marsh vegetation will also be burned to improve interspersion, and clean out the water delivery system. About 300-500 acres of uplands will be burned over a five-year period to improve grassland cover.

Wildfires will be controlled to protect refuge wildlife, resources, facilities and private property. In certain cases, prescribed natural fires which are ignited naturally (usually by lightning) will be allowed to burn under specific environmental conditions, in preplanned areas, with adequate fire management personnel and equipment available to achieve natural ignition

fire patterns. They would only be allowed to burn where there is no threat to public or private property and the fire would be considered beneficial to the habitats involved. Prescribed natural fires will be allowed to burn within the Stinking Lake Research Natural Area. Control lines will be established at the refuge boundary and along boundaries of managed fields adjacent to the Research Natural Area. A map showing the location of the prescribed natural burn area at Stinking Lake is shown in Figure 13.

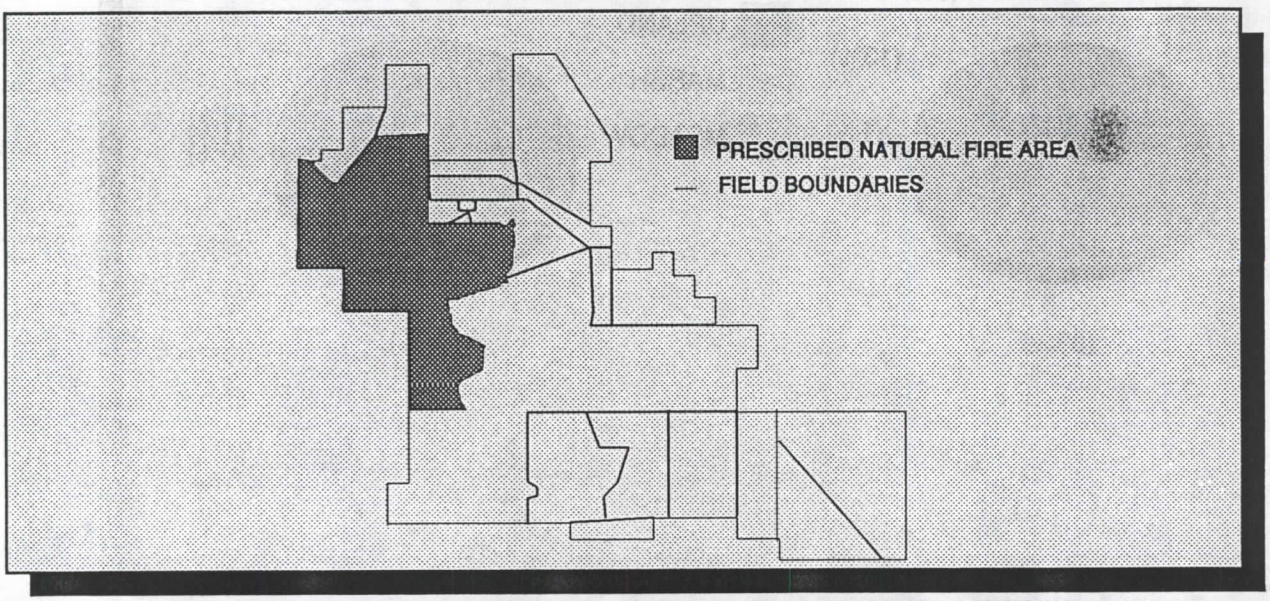


FIGURE 13. PRESCRIBED NATURAL FIRE AREA, MALHEUR REFUGE

E. Restoring Riparian Zones

There is very little remaining woody riparian habitat in the Double-0 Unit. These areas are evidenced by willow stands in scattered sections of the unit, including the edges of some man-made ditches and dikes. There is no benefit to wildlife habitat from grazing these areas.

Areas for restoration of riparian habitats have been identified near permanent water where a high potential for success exists. Work on portions of the Silver Creek Drainage and Warm Springs Slough, Figure 14, will be undertaken to improve problems such as siltation, cutbanks, lowered water tables and lack of streamside vegetation. Projects planned to improve this habitat will involve direct planting of willows and use of juniper rip-rap to improve bank stabilization. Small check structures may be installed in several areas to slow water flows and raise water tables if it can be determined they will not further alter the stream flow. Portions of the Warm Spring Slough may have to be engineered and water management changed to provide suitable riparian conditions.

Because much of the watershed above the refuge boundary on Silver Creek has been severely degraded, riparian improvement successes may be limited. Lack of a year-round water source and loss of riparian zones to reduce the effects of major flood events will make restoration along Silver Creek a challenge.

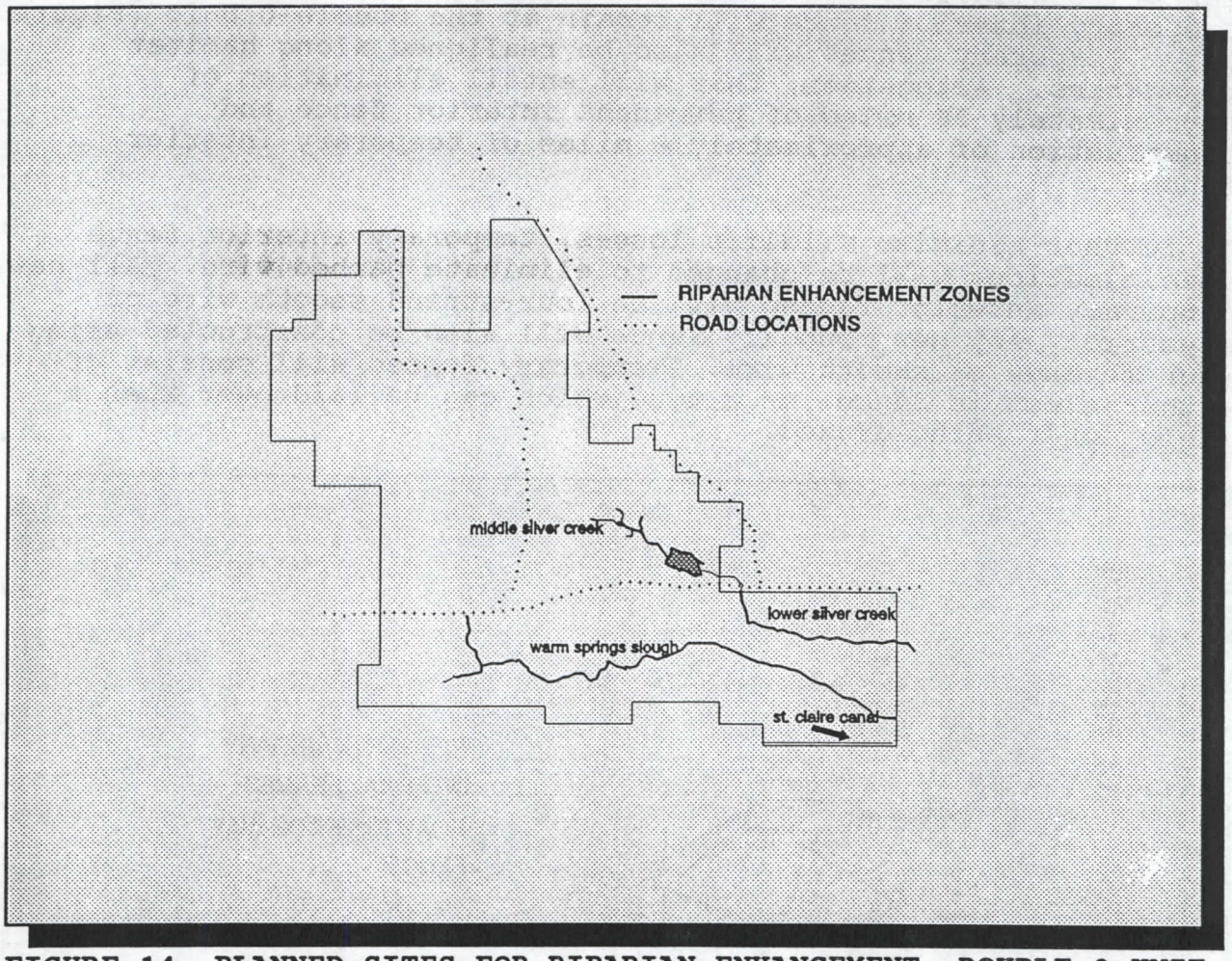


FIGURE 14. PLANNED SITES FOR RIPARIAN ENHANCEMENT, DOUBLE-0 UNIT, MALHEUR REFUGE

F. Protecting Rare Plants

The most recent rare plant survey at the Double-0 was conducted in summer of 1980. At that time, three species of rare plants, narrow-leaved water-plantain, California plantain and skeletonweed, were noted (Stern 1980): Narrow-leaved water plantain was considered, but rejected, as a possible threatened or endangered plant species by the State of Oregon. No federally threatened or endangered plants have been recorded on the refuge. Funding for a comprehensive plant survey of the Double-0 Unit has been requested. When finished, information on rare plants should be much more complete.

G. Realignment of Fence

Implementation of the preferred alternative will necessitate revisions of current fence alignments (Figure 15). Phase out of permanent interior fence is planned to eliminate any significant threat to wildlife. Once removal is complete, about 10 miles of temporary interior fence will remain at the Double-O Unit (Figure 16). Temporary fences will also be realigned along habitat boundaries. Altogether, this will entail elimination of approximately 28 miles of permanent interior fence and construction of approximately 8 miles of temporary interior fence.

To further minimize wildlife losses, temporary interior fence specifications will be changed to eliminate barbed wire. All new temporary interior fences will be four-strand smooth wire or electric. Any new boundary fence will also be constructed using four strands of smooth wire. Temporary fences will consist of either electric fences or a type which can be laid over when a field isn't being grazed.

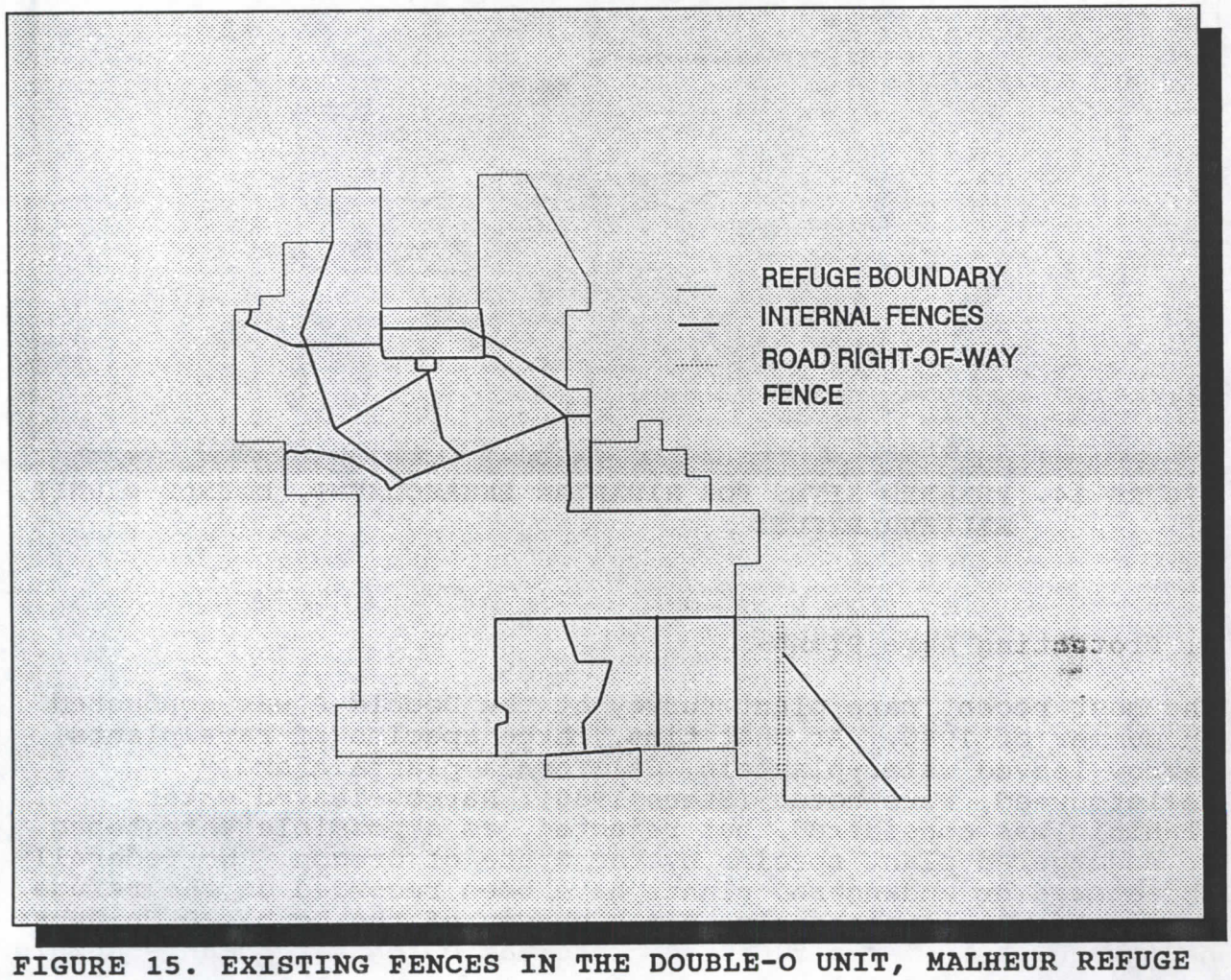


FIGURE 15. EXISTING FENCES IN THE DOUBLE-O UNIT, MALHEUR REFUGE

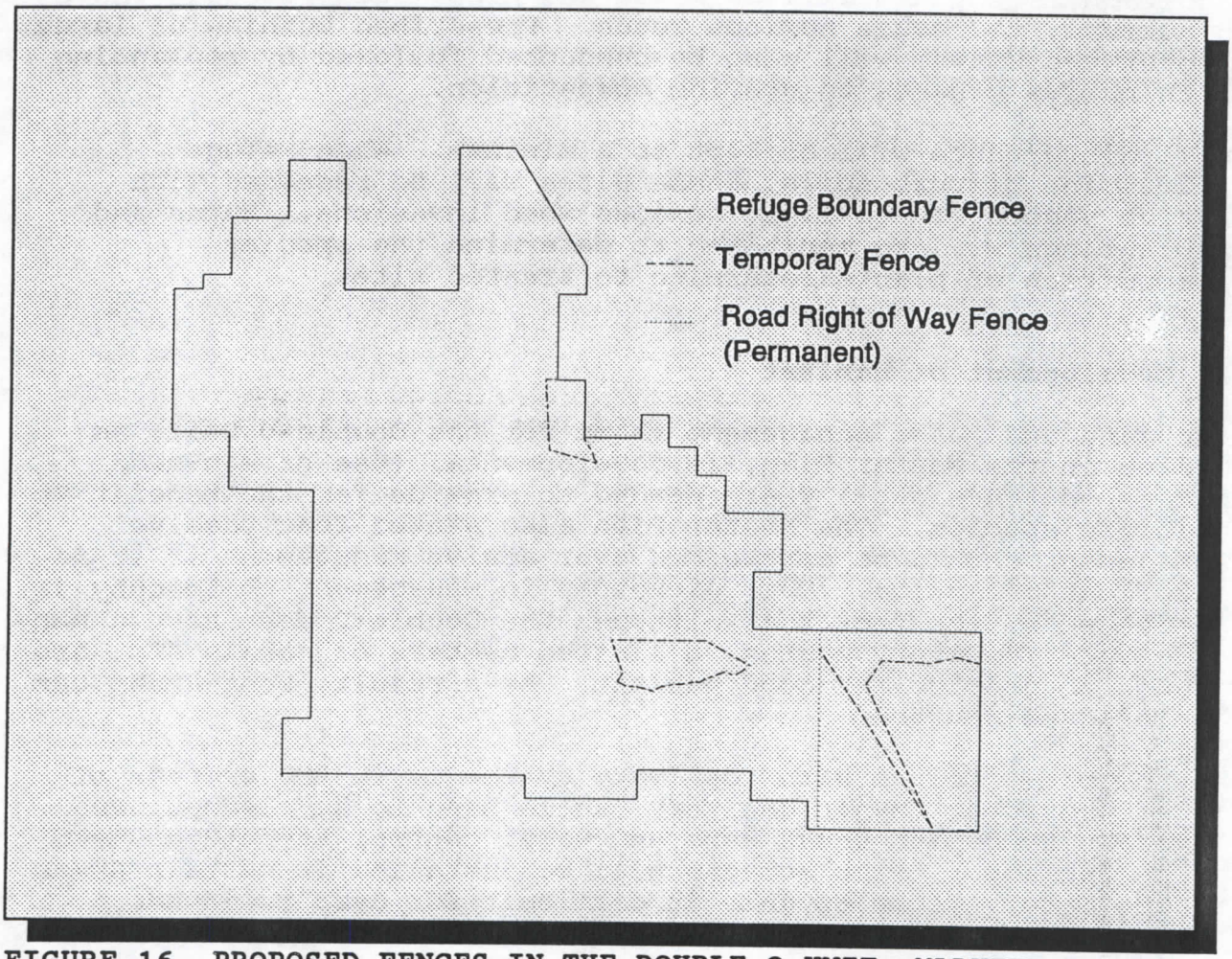


FIGURE 16. PROPOSED FENCES IN THE DOUBLE-O UNIT, MALHEUR REFUGE

H. Planting Crops

Approximately 100 acres of grain will be planted for fall sandhill crane use. Crops to be planted will include a combination of cereal rye, spring barley, winter wheat and alfalfa. Other grains are generally not suitable due to the short growing season. Because of problems with weeds, lack of a dependable water supply and the high cost of contracting, the farming program will be conducted using refuge staff and equipment.

I. Reducing Noxious Weeds

A multi-year study to find the most efficient way to reduce pepperweed on the refuge will begin in 1995. Plots will be established and pepperweed control technique such as mowing, burning, herbicides, discing and native seedings will be tested. Using the information gained from this study and others, we hope to reduce populations of the plant within the next few years. In

addition, roadsides will be mowed and areas deep flooded, where practical, to reduce noxious weeds. Prescribed burning of larger pepperweed stands will also be conducted followed by replanting with native grasses to provide competition.

Soil disturbance will be kept to a minimum. When refuge activities disturb soils, these sites will be reseeded with native vegetation to limit noxious weed invasions. Burns and replantings will be monitored to determine the species composition of plants returning to treated sites.

J. Development of Habitat

The land and water management theme for the Double-0 Unit, as stated in the Master Plan, is developmental (use of man-made canals, ditches etc.) where needed to provide for the benefit to wildlife species. The Master Plan also stated that passive management should be emphasized over active management if it is more cost effective. This dichotomy in management philosophy is evidenced by the fact that although the Double-0 does have a man-made water delivery system, a limited numbers of canals etc. are needed to provide for good habitat. As a result, most areas can be left undisturbed.

The Double-0 Unit's water delivery system is in the process of being upgraded. Major delivery canals need to be cleaned, and several irrigation check dams and water control structures need to be replaced. Fish screens will be installed in certain areas of the water system to make it difficult for carp to invade wetlands during irrigation.

Wetland habitat will be enhanced by providing late-season water for ducks and other wetland birds. Areas of high natural resource values (such as archeological sites and alkali playas) will not be sacrificed to create new wetlands. Existing sites will be enhanced, or new ones will be created in areas which can be served by existing irrigation facilities. Development of wells will be considered to maintain water in some ponds through the critical brood-rearing period.

K. Habitat Enhancement Costs

Proposed costs to implement this plan will involve the following: pond construction, cleaning and maintenance of existing water delivery systems, well development, mechanical manipulation of emergent marsh vegetation, fish screen installation, riparian restoration and fence realignment. Estimated costs are outlined in Table 2.

Table 2. Habitat Enhancement costs Double-0 Habitat Management Plan, 1995-1999.

ITEM	LOCATION	COST	RESOURCE BENEFIT
WELL DEVELOPMENT	Rock Island Field	$ 5,000	Late summer brood water
POND CONSTRUCTION	Double 0 Spring Hughett Field Martha Lake Field	$ 35,000	Marsh habitat, Late summer brood water
CLEAN AND MAINTAIN WATER DELIVERY SYSTEM	Delivery canals & spreader dikes	$ 25,000	Double-0 wetlands
OPEN ADDITIONAL MARSH HABITAT	Various marsh sites feeding and brooding	$ 5,000	Waterfowl
FENCE REALIGNMENT	Various sites	$ 18,000	Protect upland and riparian zones
GRAVELED SHOREBIRD ISLANDS	Carp Pond, South Stinking Lake Field	$ 2,000	Shorebird nesting
RIPARIAN RESTORATION	Warm Springs Slough, Silver Creek	$ 25,000	Biodiversty
TOTAL ESTIMATED COST----------		$115,000----------	

VI. HABITAT MONITORING

Monitoring of habitat conditions will be conducted to determine the effectiveness of this plan. Procedures outlined in the Refuge Habitat Monitoring and Inventory Plan (1992) will be used to conduct annual inspections of refuge habitat. Conditions of uplands, semipermanent marshes, seasonal wet meadows, woody riparian zones, and aquatic habitat will be monitored. If management actions do not achieve goals, they will be reevaluated and changed.

The Refuge Wildlife Inventory Plan will be used when evaluating the response of wildlife species to the proposed plan. This plan outlines procedures for monitoring of refuge wildlife. The majority of the procedures in this plan have been in effect at the refuge since they were standardized in 1968.

APPENDICES

APPENDIX I. PUBLIC COMMENTS

A public meeting was held May 7 and 8, 1993 at the refuge headquarters. Comments and questions generated by the group accompanied by refuge responses are listed below.

A. Public Meeting Agenda

Friday 5/07

Welcome-Introduction-Overview
Ground Rules-Agenda-Round Robin Introduction
Public Issues and Concerns
Refuge Guidelines-Double-0 Needs
Double-0 Resource Overview
Vegetation Overview
Key Species Needs
Habitat Management Tools
Archaeology
Double-0 Thesis
Field Site Visit to Double-0: Topics Included Carp, Predation and Archeology.

Summary of Issues

Saturday 5/08

Field Site Visit to Double-0: Topics Included Vegetation and Water Management.
Final Group Comments, Evaluation and Wrap up

B. Public Issues-Concerns-Comments

(FINAL DRAFT)

Habitat Treatments

**** What is the evidence that burning, grazing, or haying are the most suitable methods for providing short-grass meadows for the nesting of shorebirds? What alternatives may be less disturbing to the ecosystem? Could an ecosystem approach help identify similar habitats in other areas that would require less interference?**

The evidence for this management scheme is from Foster (1985) who studied habitat selection by nesting birds in the northern portion of the Double-O Unit. He concluded that shorebirds used shorter and less dense vegetation than ducks and that shorebird nests were found exclusively within the bluegrass-saltgrass-sedge vegetative associations. The use of burning, grazing and haying is based on the observations and experience of refuge biologists and habitat managers. Concerning less disturbing alternatives to the ecosystem, we are not aware of any other practical methods to enhance short-grass shorebird nesting habitat. The most significant shorebird nesting habitat in the Harney Basin ecosystem is on the Malheur Refuge. Other areas of significant shorebird habitat are primarily private lands which are traditionally hayed and grazed.

**** What evidence suggests that burning, haying and rake-bunch grazing of meadows will provide high protein feeding sites, reduce water shortages, and reduce coyote activity?**

The evidence for this management approach is based on observations and studies by refuge biologists and habitat managers. A 1988 through 1990 study on spring duck use and land-use treatments on Malheur Refuge (Ivey, unpubl. data) indicates that duck use was higher on intensively treated sites in spring than on idle sites. Duck pairs use wetlands that have been treated (burned, grazed, mowed) earlier in the season than wetlands with idle vegetation. Theoretically, treated areas absorb more solar radiation, and therefore soils warm much earlier than non-treated areas. This results in earlier plant growth and earlier availability of invertebrate foods. New plant growth and invertebrates are important sources of protein, needed by breeding waterfowl and other birds for egg laying as described by Eldridge and Krapu (1988). There is no evidence for, nor does this plan claim, that haying, grazing and burning reduce water shortages.

Based on a study by Cornely et al. (1983), small mammal populations decline after treatment of meadows on Malheur Refuge. In theory, a reduced prey base in an area would lead to reduced predator activity, including coyotes. This is also supported by refuge nest data, which shows that ground nesting birds generally experience lower mammalian predation in treated fields.

**** No information was presented to support plans to burn, hay, and graze meadows for breeding ducks. The plan admits that past grazing has damaged the land and that not all areas benefit from grazing practices. What vegetation types and wildlife species do benefit from livestock grazing? What is the evidence for this benefit?**

Information to this effect is presented in Appendix II; Important Wildlife Species' Needs, and Appendix III; Habitat Management Strategy.

**** What are the costs of livestock grazing to soils, water quality, weed dispersal, insects, other wildlife, irrigation ditch maintenance etc.?**

No direct data comparing the costs of livestock management in terms of damage to resources has been compiled for the Double-0 Unit. The intent of this plan is to use grazing only in meadow areas where it has demonstrated benefits to spring waterbird use.

**** Why were scientific papers showing the negative effects of grazing at Malheur not discussed?**

This information has been added to Appendix III; Livestock Grazing. This was not included initially because it was discussed in the Blitzen Valley Plan, and we had hoped to reduce the size of this document.

**** What are the cumulative effects of haying etc. on water quality, non-target species, plant community composition, insects and other prey items for wildlife, soil fauna and flora etc?**

Effects of haying on water quality, non-target species and soil flora and fauna have not been investigated on Malheur Refuge. Plant species diversity in meadows decreases with increased irrigation (Rumburg and Sawyer 1965). The least tolerant of water are grasses and forbs followed by sedges. The most tolerant of water are rushes which generally increase with increasing water levels. As for the invertebrate population, it has been shown that haying decreases total biomass production by removing detritus but increases invertebrate species diversity (Kaminiski and Prince 1981). The tradeoff for the loss in biomass production is that hayed soils warm sooner, and invertebrates become available earlier for breeding birds which rely on them.

**** What is the carrying capacity for the unit?**

During development of the Master Plan, carrying capacity for certain species was estimated, based on habitat suitability. For the Double-0 Unit, the following numbers were estimated:

Production: trumpeter swan - 3; sandhill crane - 22; canada goose - 368; dabbling ducks - 18,949; diving ducks - 1,665; marsh and water birds - 245; snowy plover - 6; raptors - 235.

Maintenance in use-days (a use day is each day each bird uses the area): sandhill crane - 75,040; swans and diving ducks - 333,800; goose and dabbling ducks - 2,514,350; shorebirds, marsh and water birds - 424,920; long-billed curlew - 19,307.

Refuge wildlife goals under this plan are based on habitat quality and not on species numbers. Providing the highest quality habitat for a variety of species is the our main objective.

**** It is clear that grazing, haying and cultivation have caused many of the problems the Refuge is now trying to control. A paper by D.M. Taylor on the effects of cattle grazing in the Malheur National Wildlife Refuge (1986, Effects of cattle grazing on passerine birds nesting in riparian habitat, Journal of Range Management 39:254-258) demonstrates the negative effects of grazing on a large number of bird species. This and other scientific papers should be discussed.**

Additional documentation has been added concerning effects of grazing on refuge habitats in Appendix III.

**** Without the aid of haying and grazing there would be a great reduction in the migratory bird population at the Double-O.**

If not replaced by other management tools, elimination of haying and grazing from the refuge would likely reduce use of the refuge by populations of migrating water birds such as ducks, cranes, geese and shorebirds. Reduction of high protein feeding areas important to nesting waterbirds could result in lower hatch success and production of young. Other animals such as songbirds, many raptors, and small mammals would increase due to increased feeding, resting and nesting cover.

**** Grazing and haying also stimulate grass but do nothing to stimulate the weeds and if done early enough, will even discourage the growth of weeds and stop the spreading of the seed.**

Grazing and haying can be detrimental or beneficial to certain weed species depending on season of use, amount of vegetation removed etc. Also, while weeds may be grazed off by cattle, viable seeds may be carried by livestock and deposited in other locations. Perennial pepperweed has been found in varying degrees on grazed, hayed, burned and idle fields on the refuge. The highest concentration of weeds has been found in disturbed sites such as spoil piles, corral sites, overgrazed areas and previously flooded fields.

**** Haying provides early food for the birds by allowing meadows to "green up" earlier in spring, and by providing open water in the marshes where cattails and bulrush would otherwise overcome any migratory bird use.**

Haying does provide early "green up" food for migrating birds. However, cattails and bulrush provide important resting and nesting sites for many species of birds making them an important feature of refuge habitat management. Haying cattails and bulrush has only limited value in opening up marshes. It has a short term effect and regrowth is typically unhindered.

**** How long are meadows idle? If a different 50% are treated every year, then conceivably no meadows would be idle more than a year.**

Refuge meadows identified as "idle" will generally remain so until their vegetation becomes lodged and unable to support suitable cover for wildlife. This length varies depending on water availability, type of vegetation present etc. Generally after 10 years of "idle" status a meadow area may benefit from a disturbance. The preferred method for disturbance of "idle" refuge meadows is prescribed burning.

**** Can you show that untreated idle areas become less attractive to ducks over time?**

No studies have been conducted concerning the attractiveness of idle meadows over time at the Refuge.

Grazing Reduction

**** Why is livestock only being reduced by 14%? I am distressed that the reduction in AUM's is only 28% (page 29 of draft).**

Livestock use can be measured several ways. Using acreage, use is being reduced from 2400 acres to 1500 acres; approximately 38%. Using AUM's, use is being reduced by approximately 14% although overall economic use including grazing and haying will be reduced less than 5%. Grazing and haying are tools used to improve conditions for wildlife. Their use is based on the needs of wildlife species.

**** If we could eliminate grazing, we could eliminate all the interior fencing at the Double-0. This would reduce wildlife mortality per your statement in the plan. -- On page 18 of the draft the last paragraph describes fence specifications to be used in the unit. Why would you want to use any barbed wire in the unit? I believe there are several manufacturers that produce a 2-strand smooth wire that looks just like barb wire only without the barbs.**

After reviewing our wildlife fence mortality data we decided to remove all permanent interior barb wire fences in the Double-0 Unit.

**** Eliminating grazing would save some money by eliminating the proposed fencing. Mowing and burning are easier to implement; burning is expedient and mowing is easy and can be done fast.**

Total elimination of grazing would not necessarily save the refuge time or money. Prescribed burning takes considerable time and personnel to plan and implement, while mowing requires administration and monitoring just as a grazing program does.

Plan Content

**** There is not enough data in the draft plan (or references to research) to show that the proposed management actions are in the best interest of the native wildlife inhabiting the refuge.**

**** The management plan is incomplete. It gave too little detail to be readily comprehended by the public (or even by new Refuge managers), gave no experimental or published evidence to support conclusions and management decisions, did not present impacts (cumulative or otherwise) on species, and no alternatives were considered.**

**** A more comprehensive, ecosystem-level and creative plan is called for. The continued emphasis on using failed management tools of the past is not providing the staff of Malheur the latitude necessary to develop new and more effective approaches that are in compliance with new Department of Interior guidelines to manage for entire ecosystems.**

We believe we have addressed most of the perceived shortcomings of the draft plan in this final Double-0 Habitat Management Plan. We consider this to be a comprehensive document which addresses wildlife habitat needs in the Double-0 Unit in terms of an ecosystem approach. The Double-0 provides some of the best and most suitable habitat for cranes, shorebirds and other waterbirds in the Harney Basin ecosystem. The continued use of haying, grazing, burning and idle management strategies to provide a mosaic of habitats including high quality feeding areas has been, and will continue to be, an integral part of refuge management. Extensive references relating to proposed management actions are discussed in Appendices II and III.

**** The Double-0 Management Plan strongly suggests to ONRC that the Malheur Refuge needs to comply with NEPA requirements to develop a detailed and documented EIS with alternative management plans. This plan is a federal action with significant environmental consequences; therefore your actions should comply with NEPA. The EIS produced earlier this year by Hart Mountain Refuge should become the standard for the Fish and Wildlife Service.**

**** The Refuge Master Plan EA is very generalized and does not address the specific management actions contemplated for the Double-0 Unit. It also states on page 102 that " if the HMP results in a need to increase or decrease an economic use by more than 10%, a separate EA will be prepared."**

The intent of the Master Plan EA is to address refuge management actions in a generalized manner. Specific management actions on the Refuge are intended to be covered under the Double-0 management plan.

Overall economic use of the refuge will change very little under this plan. While grazed acres will decrease by approximately 40%, haying acreage will increase by over 50%. In total, the economic decrease is less than ten percent.

**** Little or no information was given to support statements in the draft on the natural history of the Refuge.**

Little information was given because there is very little natural history information available concerning the Refuge or the Harney Basin.

**** There has not been any discussion about recreation opportunities such at bird watching, hunting, outdoor classrooms etc.**

Recreational opportunities are discussed in the Draft Public Use Plan which is currently out for review.

**** On page 12 of the draft in the first paragraph under habitat management you state rare plants may occur in the unit. In 1980 skeleton weed that was apparently rare was found in the South Stinking Lake Field.**

At present there is little known concerning rare plants in the Double-0 Unit. We hope to fund a plant survey in the near future. A search for skeleton weed has not been conducted since 1980. The South Stinking Lake Field will not be grazed or hayed under this plan.

<u>Grain Planting</u>

**** What are the alternatives to planting grain crops for sandhill crane use? Could the elimination of livestock grazing or a larger landscape perspective or reduced disturbance by farm vehicles allow native grains to become more abundant?**

Historically, cranes relied on foods in wetlands and associated native grasslands to provide them energy for migration. With over 60% of the wetlands lost in the western states, cranes have adapted and become dependent on cereal grain crops. Since most private grain fields are hunted for geese and pheasant, cranes avoid these areas. The refuge grain fields

provide the cranes with an opportunity to gather strength and energy in an undisturbed setting, before migrating to California.

Planted grains such as barley and rye constitute significantly less than one percent of the area in the Double-O Unit. Grains are planted to provide a high quality carbohydrate food source for migrating cranes during September and October. The only alternative to planting grain crops is to not plant them. There are no native grains available in fall in this area. Elimination of livestock grazing would probably have no effect on fall migrating cranes. Disturbance by farm vehicles in fall is not a factor to migrating cranes because the planting and discing of farmland occurs in spring.

Sandhill crane management is coordinated through the Pacific Flyway through the Pacific Flyway Council. This group is composed of biologists from western states and federal agencies which have an interest in the welfare of migratory birds such as cranes.

Predator Control

**** Why is predator control the best way to reduce sandhill crane mortality? Although it has been shown that predators do take cranes and other ground-nesting birds, could this predation be limited by other methods such as reducing grazing and haying?**

**** Revealing more of the predator control activities would have been illuminating.**

In 1986, an EA was prepared to select alternatives to enhance production of the declining sandhill crane population on Malheur Refuge. One result of the assessment was development of a predator control plan to enhance crane production. In 1989, the predator control plan was extended by a second EA, for a five-year extension, based on the success achieved during the first three years of the pilot project. When these two EA's were written, habitat management to enhance crane production was also evaluated and considered. Based on our crane nest data, it appears reduced haying and grazing may reduce raven nest depredation, but conversely increases coyote nest predation.

We are in the process of completing another EA to address future crane management needs at Malheur Refuge. We are reevaluating the refuge's objectives for the local crane population and will be reviewing management tools to manipulate habitat, food, parasites and predators for the benefit of cranes.

**** If you are justifying cattle grazing for the benefit of cranes, this is certainly not the case in the absence of predator control. I found a 21% higher nesting success in idle wetlands compared with winter grazed. There should be a statement that "livestock grazing improves production only if predator management is practiced. Otherwise you are going to create a greater sandhill crane egg slaughter."**

During the eight years of predator control, there were no significant differences in crane nesting success between land use treatements. We are aware of the potential predation problems and will continue to monitor crane nesting success and predator losses. We will adjust our management in the future if necessary to minimize the risks to cranes and optimize habitat benefits.

Prescribed Burning

**** What are the effects of burning on upland species other than Great Basin Wildrye? How often will these areas be burned? What are the reasons for choosing 10-30 acres to be left unhayed?**

Information concerning fire effects has been added to Appendix III. Upland sites will be burned as needed, usually at 10 year or greater intervals. The 10-30 acre figure is based on the concept that larger cover blocks are better for nesting ducks, because nests in smaller blocks of cover are generally more vulnerable to predators.

**** Burned areas should be monitored for any increases in weeds.**

**** In the Double-0 plan, prescribed burning will replace some of the haying and grazing. For most fields, I believe this to be a flaw in the plan. The fields that are prescribed to be burned instead of hayed or grazed are, for the most part, in areas where noxious weeds are at their worst. Since prescribed burning can only be done in the fall, after the weeds have spread their seeds, the noxious weed problem will intensify, affecting not only these fields, but every at the Double-0 including private property and Bureau of Land Management Land.**

Prescribed fire is planned for late winter in areas which would most benefit from this type of treatment, generally uplands and marshes. Fire is a natural ecological process in the Great Basin Ecosystem which cannot be duplicated by haying or grazing. Fire tends to invigorate grasses thereby increasing competition with weeds.

**** Fire is less effective at the Double-0 than in the Blitzen Valley because of meager vegetation due to poor soil conditions and mismanagement of idle fields.**

Although fuels in the Double-0 may be less continuous than in the Blitzen Valley, fire is just as effective in many habitat types. In drier sites, such as, greasewood uplands or alkali playas

where the need for burning is limited, fire will be used infrequently.

**** Fire destroys the peat moss and other ground cover which holds moisture in the soil. This moisture is needed in the summer to provide the habitat that is essential to the migratory birds.**

Peat soils at the Double-0 are limited in area. A prescribed fire may or may not burn a peat soil depending on many factors including soil moisture, wind speed, air temperature, fuel loading, fuel makeup etc. Loss of ground cover in soils is temporary and, in fact, wildlife generally respond more positively to burning than to haying or grazing treatments.

**** Prescribed burning of riparian areas is more detrimental than haying or grazing.**

We do not plan to burn any riparian areas in the next five years.

Habitat And Wildlife Studies

**** The Refuge Habitat Monitoring and Inventory Plan (1992) which is cited but not referenced in this plan, was to support the Blitzen Valley Management Plan and provide a basis for scientifically evaluating the effects of vegetation management.**

This is correct. The Habitat and Monitoring Plan has been used as a guideline for determining habitat quality using the various management techniques discussed in the Blitzen Valley Habitat Management Plan and will be used to monitor and evaluate habitats in the Double-0 Unit.

**** It is not clear when the data for Table 2. was collected, since there is a shift from treated to untreated wetlands.**

The data was collected from several different sets of paired transects in the Blitzen Valley in 1988, 1989, and 1990.

**** Censusing birds in the treated areas must be much more effective than in the dense untreated vegetation. How was this compensated for?**

Transects were paired along fencelines with a different treatment of each side of the fence. They were 100 meters wide and were censused by driving a 4-wheeled motorcycle through the center. Essentially, all large birds were flushed and counted. The technique may have missed some smaller secretive species such as snipe and rails in untreated fields.

**** We need more of the comparisons as seen in Table 2 of Appendix II. Hopefully in the future, this can be written up more fully to give details on experimental design, replications etc.**

We are planning on submitting these data for publication.

**** A basic question that is not adequately addressed is the optimal balance between treated and idle meadows. Can you show that the 50:50 ratio of treated to idle meadows maximizes waterfowl production?**

"If 'managing about half of the unit's meadow vegetation as idle for nest cover will provide ample nest sites for the ducks.", won't more 'idle' mean more ducks?" Wouldn't there be 'ample' nourishment for cranes and others without grazing? All of the other arguments <u>for</u> grazing seek to <u>maximize</u> benefits; this argument <u>against</u> grazing seems to favor something short of that.

We can not show that the 50:50 ratio of treated to idle meadows leads to maximizing waterfowl production nor is that our intent. Treated meadow areas are used extensively as feeding sites by cranes, ducks and geese, in theory providing the protein these birds need during the breeding season. Wetter areas within meadows often can't be irrigated early enough to avoid flooding of nests and are better managed to discourage use as nesting sites and encourage use as feeding sites by treating the meadows. When we developed the 50:50 goal, we examined past refuge nest data to determined if leaving half idle would leave enough nesting cover to support moderate densities of nesting ducks. This level of treatment appears to provide ample nesting cover for ducks, while providing good feeding areas as well.

Based on past data, it does not appear that more idle means more ducks. When initial management changes were implemented on the refuge to increase idle nesting cover from 1972 through 1982, the refuge's population of breeding dabbling ducks remained essentially unchanged (Ivey and Paullin 1985). This suggests that nesting cover was not the primary factor limiting duck production at Malheur.

Regarding ample foods for cranes, there would very likely be ample food for cranes on the refuge without using livestock grazing on meadows. Refuge crane nest data suggest that cranes nest earlier in grazed fields than idle fields, supporting the theory that grazing better meets their nutritional needs.

**** What evaluation has been made at Malheur showing that the benefits of grazing outweigh the costs?**

No evaluation of this type has been conducted.

A habitat monitoring plan has been in effect in the Blitzen Valley for the last five years. This monitoring has been conducted on various habitat types (uplands, meadows, riparian, emergent, open water) to determine habitat quality. This habitat data will be compiled and provided in the 5 year summary of the Blitzen Valley Management Plan in the spring of 1995. Preliminary figures show improvements over the past five years in the quality of upland, riparian and open water habitats. The present condition of refuge habitat combined with higher numbers of sensitive species, such as greater sandhill cranes and willow flycatchers, indicate that the variety of management techniques employed at the refuge are benefitting habitat and wildlife.

Riparian Restoration

**** You don't say anything about possible rehabilitation of the riparian areas. Could willows, dogwood etc. be planted once the cattle were removed?**

**** Is there a potential to develop more woody riparian habitat in the Double-O?**

Yes. This information has been added to the plan on Page 26 under, E. Restoring Riparian Zones.

Plan Content

**** The Refuge needs to determine what tools to use and when to use them to manage habitat and wildlife populations.**

This will be accomplished through implementation of this plan. Habitat management tools used in managing wildlife populations are discussed in Appendix III.

**** I am concerned about treatments to control vegetation, tradeoffs, i.e. cost of fencing to control livestock vs. income to government.**

We are required by policy to receive fair market value for any economic use of refuge resources. With this plan fencing, on the unit will actually be reduced by 20 miles or 63%. There will also be about eight miles of new fence construction under this plan to protect habitats from livestock grazing. The fencing will cost approximately $3000.00 per mile, but we feel this tradeoff is justified.

Removal of meadow vegetation to provide feeding and pairing areas for waterfowl and cranes etc. costs money. Mowing, burning and grazing all require some type of work to provide the desired conditions. Over the long term, haying is probably the most economical in terms of refuge money spent.

**** This is the third management change at the Double-0 since the early seventies. Why?**

This is the first habitat management plan developed for the Double-0. During the past two decades, changes in management of fields have been implemented. These include reducing acreage that is grazed and changes in our water management. Although there have been changes in management practices, no formal management plan has ever been written for the Double-0. The Refuge Manual requires a management plan to be prepared for all refuge units.

**** The goal of the Double-0 should be a vision of what it will look like in five years? Be specific, habitat types.**

Within the plan, we have described desired habitat conditions for the Double-0. To summarize, we want optimum vegetative conditions for a variety of wildlife species and therefore have different objectives or goals for different areas. For spring migration, treated meadows are needed for birds such as cranes, redheads, and mallards to build up protein reserves for egg laying or continued migration. Shorebirds need open meadows or mudflats for feeding areas. Dense nesting cover is needed in meadows, marshes, uplands and riparian sites for a wide variety of birds including cinnamon teal, mallards, sandhill

cranes, white-faced ibis, willow flycatchers etc. In late summer, brood water areas are important for survival of waterfowl and waterfowl broods.

**** How will the Double-0 plan be financed?**

Work completed under this plan will be financed primarily through our base budget or by work done by refuge permittees. Without this plan, most of these projects would still be completed because they involve ongoing management and maintenance of refuge facilities.

**** Would like to see justification as to why management practices continue or change when the plan is updated.**

We will review and evaluate our management actions at the end of a five-year period. Our findings will be made available to the public.

**** When will the plan be implemented and for how long??**

Most of the proposed actions will be implemented in the fall of 1995 although a few have been implemented in the fall of 1994. We anticipate this to be a long-term plan to be evaluated and modified as better information is developed, with formal reviews at five year intervals.

**** Will the Refuge be able to change direction if something in the plan is not working? ** Management plans should be able to be fine tuned.**

Definitely yes. If there is a change to be made which will better serve refuge resources, it will be implemented. Proposed actions in the plan can be changed if they are not meeting habitat objectives. The monitoring system that has been established will identify problems that may arise. Adjustments will be made to assure that habitat objectives are met.

**** Will the Refuge get political pressure to change the plan from special interest groups??**

A well written plan based on the best current biological knowledge should be able to withstand pressure by any special interest group. Hopefully every concerned group and individual will have had a chance to comment before the completion of this plan.

**** If the Refuge manager changes will the plan change??**

No. One of the primary reasons for writing a plan of this type is to provide continuity, consistency and justification for Refuge management practices. An approved habitat plan won't be changed by a new manager without a good biological reason.

**** Is the Refuge considering the economic stability of the permittees involved?**

Yes, however, refuge policy is quite clear that compatibility and not economic stability is the major factor on which secondary uses of refuges are based. While the economic stability cannot be a primary objective of this plan, the Refuge will commit to maintaining as stable a program as possible for refuge permittees if that program is biologically sound.

****"Where and under what circumstances did 'the public identify issues important to include in the management plan'? Is this not the first draft?"**

On January 15, 1993 a letter was sent to individuals and groups on our public participation mailing list asking for the public's ideas about what things should be addressed in the plan. A preliminary draft was put together in March 1993. The public was invited to review and comment on the proposed plan.

****Page 11, paragraph 5: 'economic use'? "I thought this was a 'management tool'."**

It is both.

****"If areas 'treated' with grazing are to be standardized, how will the flexibility discussed in the previous paragraph be maintained? Does this mean that permits will be issued on an annual basis for five years?"**

For the areas which can be irrigated annually from the springs, areas hayed or grazed will remain standard for the five-year period, unless problems with individual fields become apparent. Permits will be issued annually for these fields. For the areas without this dependable water supply, treatments will be allowed on selected fields only if they have received irrigation water.

****"Before any of these plans are completed, I request and urge the Service to <u>demonstrate</u> that the haying and grazing '<u>will be used only where it specifically will provide benefits to refuge wildlife</u>.'"**

That is our intention with this plan.

"You need to define 'wet' and 'dry' years."

Wet years are years when the Double-0 Unit receives water from the Silver Creek drainage. This occurs when precipitation is at least 80% of normal. During drier years, Silver Creek water does not reach the refuge.

****"What species [of native plants] would you plant, and what is the record of native grass plantings on the Refuge? Specifically, what was the fate of the native grass planted in NW Big Sagebrush in the Blitzen Valley unit in 1982 [1983]?"**

We would plant native grasses such as Great Basin wildrye, creeping wildrye or saltgrass (depending on the site), using seeds or roots from local sources when possible. We have made a few attempts of native seedings on the refuge in recent years, with limited success in establishing native plants.

Regarding the 1983 fire rehab seeding, Great Basin wildrye was aerially seeded and the seeding appeared to be successful, although no actual field data were gathered on the site by refuge personnel.

****"Will this [the fence construction and removal] be contracted, or accomplished by Refuge personnel?"**

Fence removal will be conducted by refuge staff and volunteers, under supervision of refuge staff. New fence construction would primarily be constructed by permittees.

****"You haven't even described what criteria will be employed to '...determine the effectiveness of this plan.'" "What does 'reviewing conditions' mean?"**

These criteria are described in this final plan. We used the term "reviewing conditions" in the initial draft plan to mean collecting data on site conditions for various habitats to evaluate our progress towards habitat goals identified in this plan.

****Page 19, paragraph 2: "What is the 'Refuge Wildlife Inventory Plan'?" "What are the criteria, what are the thresholds, what will the actions be? What numbers, what densities, what nest success, what recruitment will be the criteria, and what will happen if...?"**

The Refuge Wildlife Inventory Plan outlines routine, annual, recurring wildlife monitoring for the refuge and defines and standardizes methodology for collecting wildlife monitoring data. Wildlife objectives were defined in the Refuge Master Plan. Those objectives are expressed in terms of production and use on the refuge by selected species and groups of species. Those objectives guide management decisions on the refuge. This Plan is available upon request from the Malheur Refuge.

Vegetation Management

****"Where are the data supporting your statement that 'Most private grainfields in the area are hunted for waterfowl and upland game birds causing cranes to abandon them as feeding sites.'?" "Have you any data to indicate food is a limiting factor in this case?"**

This is based on our observations of cranes abandoning use of private grainfields after hunting season opens. We do not have data to indicate that food is a limiting factor. However, when the refuge supports good grain crops, fall crane use is high. Conversely, when grain crops are poor, fall crane use is low.

****What is "the scientific basis of your characterization of grazing as a 'management tool' at Malheur NWR"?**

This is covered in Appendix III.

**** Is continual rest achieving desired future condition?**

Management of an area is a matter of perspective. We look at an area and ask the opposite question. "Is continual use achieving the desired future condition?" Our desired future condition has been discussed extensively in this plan. Active management (burning, grazing, haying) involves generally less than 25% of the acreage at the Double-0. The remainder of the area will be under what you have termed "continual rest." We feel this is appropriate given the ecological characteristics of the area.

**** Grazing has been reduced at the Double-0 by 50% since the early seventies. Why?**

Grazing was reduced because the extensive grazing program caused damage to upland habitats, and limited the amount of cover available for nesting birds.

**** Why doesn't the refuge graze uplands instead of burn them?**

Livestock grazing alters the structure of shrubs and grasses, making the cover undesirable for some nesting birds. Fire is a natural component of the Great Basin ecosystem, and native upland plant communities of this region are adapted to periodic fires. Bunchgrasses which provide good cover are stimulated by the effects of fire. In general, grazing leads to increased brush while fire leads to increased grass, and grass makes better nesting cover.

**** Noxious weeds are a major problem at the Double-0. ** How is refuge going to control perennial pepperweed?**

Noxious weeds continue to infest both public and private lands throughout the west and the refuge is no exception. Recent guidance from our Regional and Washington offices have placed restrictions on the use of chemicals, thus limiting which herbicides can be used and how they can be applied. Because the philosophy of reduced chemical use can be expected to continue, we propose to look at other ways of reducing weeds. We are proposing the experimental use of several tools to reduce or eliminate pepperweed infestations. These include use of sheep grazing during the growing season; spot mowing problem areas; and using prescribed burning in combination with other tools.

"What noxious weeds are in need of control, and have a history at Malheur or elsewhere of being successfully controlled by techniques you advocate?" "How do you define 'unnatural factors'?"

Our two biggest problem weeds in need of control are perennial pepperweed and Canadian thistle. We have had some limited success in reducing Canadian thistle populations by allowing earlier mowing and also introduction of insects for biological control.

**** A permittee expressed concern about managing for tall rank vegetation when birds were found in short grazed habitat in sixties and seventies at Double-0.**

During the sixties and seventies, the entire Double-0 Unit was grazed beginning in early July and extending through March. Short grazed habitat was the only habitat available for the birds to use. Refuge studies have shown ducks and some other birds prefer tall rank vegetation for nesting.

**** A neighbor expressed concern about prescribed fire getting away onto private lands.**

While a few of our prescribed burns fires in recent years have escaped, none of them have moved off the refuge. We will follow our fire management policy and the recommendations of the 1992 fire review committee to minimize the risk of fire affecting adjacent landowners.

**** At the Martha Hanley Field, what is the purpose of moving the fence and what kind of fence will be built?**

We plan to remove any unnecessary fences under this plan. Since we do not plan to allow grazing in the Martha Hanley Field, the only fence needed will be the boundary fence.

****"You would be hard-put to demonstrate that livestock grazing in the aggregate has been a 'management tool'. Critical to your argument is your definition of 'benefits'. What <u>is</u> that definition? Does it just mean 'more'?"**

Livestock grazing is one tool which can be used to enhance certain habitats for wildlife. The benefits of dormant season livestock grazing in meadows include: early green-up of vegetation and availability of invertebrates which provide high quality foods for certain breeding and migrating birds in early spring (e.g. geese, ducks, cranes); and creation of open, sparse vegetative conditions which are attractive to some species (e.g. nesting shorebirds).

**"If there are data demonstrating that perennial pepperweed has 'replaced some native plant communities on the Double-0 unit', provide them here along with results that support the use of sheep or goat grazing to control it."

The pepperweed invasion into native upland and meadow habitats is readily apparent. We have not collected data on pepperweed sites but stands of pepperweed are quite extensive in some areas. We do not have any experience in using sheep or goats to control weeds. These animals are used in other areas for control of certain weeds. If we do use sheep or goats to attempt control of pepperweed it will be on a small-scale, experimental basis only, until their utility is proven to us.

**"If there is 'no apparent benefit in using livestock to manage upland or woody riparian communities', how can you 'manage...' this way? Isn't this in fact mismanagement?"

The Double-0 Plan does not allow use of livestock in these habitat types, rather it focuses limited grazing on wet meadow habitats where no upland or riparian conflicts occur.

**"Please provide me with reference to publications supporting the beneficial effect of dormant season grazing on wildlife populations."

See Appendix III.

**Page 9, paragraph 3: "Where are the data?"

The statements regarding grazing of meadows resulting in warming of soils, earlier green-up of vegetation and earlier availability of invertebrates for food are theoretical. Data presented in Table 1, Appendix III support this theory.

**Page 9, paragraph 4: Do these alleged densities have any significance? Is this land supplying something critical that is otherwise unavailable?

Statistical tests have not been conducted on these data. Higher use of grazed areas suggests that birds are finding something (theoretically food) which makes these areas more attractive to birds early in the season.

**Page 9, paragraph 6: "Please explain to me where and when haying only has been able to 'eradicate noxious weeds'."

The word 'eradicate' was a poor choice in this case. A study conducted in the south Blitzen Valley in 1982-1984 examined the effects of mowing at different development stages of Canadian thistle. The results showed that mowing thistle after flowering, but before seed fully developed, resulted in a 69-75% decrease in stem density (Unpublished data, Malheur Refuge files).

Page 9, paragraph 6:[Regarding hay-only] "I ask the same question here as I have asked about relative to the alleged benefits of grazing to wildlife in meadows." "Is there <u>any</u> data to support the observation that grazing or mowing contributes directly to the initiation of egg laying, or that egg laying is later, reduced, or impaired in any way in the absence of these largely denuded fields?"

[Regarding prescribed burning-] "What is the <u>real</u> advantage to 'early green up'? "Are there any data demonstrating that wildlife is less successful, productive, or dense on an area-wide basis in the absence of these 'treatments'?"

Page 18: "Where are the data supporting the fact that this does what it is claimed to do, that this use is necessary or critical, or that waterfowl, crane, and shorebird populations would be less dense (abundant) or suffer reduced reproductive success in the absence of the cattle and mowers."

Crane nest data collected from the refuge from 1966-1988 shows cranes nest earliest in burned areas, followed by mowed and grazed areas, and latest in idle areas (C.D. Littlefield, pers. comm.). We do not have any data to demonstrate that wildlife is less successful, productive or dense on an area-wide basis in absence of these treatments.

Page 10, paragraph 1: "What do studies 'suggest' about ungrazed areas by comparison [to hay-only]?"

Duck nesting studies in the Blitzen Valley and Double-O units show that ungrazed areas (idle) support higher nest densities, but lower nest success than hay-only areas.

What is the effect of burning on non-game species?

Burning is a natural process in the ecosystem which some non-game species have evolved with and adapted to. Sandhill cranes are particularly attracted to burned sites in wetlands. Cornely et al. (1983) found that small mammal densities were reduced in meadows shortly following a prescribed burn, but had recovered to support the highest densities (in comparison to hayed, grazed, and idle plots).

In upland sites, burning tends to lead to an increase in grasses and decrease in shrubs. Therefore, burning is generally beneficial to grass-dependent species and generally detrimental to shrub-dependent species.

What are the rare plants at the Double-O?

These plants include: narrow-leaved water plantain, California plantain, and skeletonweed.

Predator Management

**** Why is the Refuge concerned with predator populations now?**

Predator populations are of concern because they limit the productivity of sensitive species such as greater sandhill cranes.

****Page 5, paragraph 5 (Final Draft): "Please provide data supporting your statements in the first two sentences of this paragraph."**

The statement regarding predators severely limiting productivity of several important wildlife species on Malheur Refuge is well documented for cranes (Paullin 1989a). Refuge data on ground nesting ducks show high nest losses to predators during some years, with nest success rates as low as 9%.

Water Management

**** Because of Refuge water management practices, the refuge has lost 40% of their good forage in the past twenty years.**

Our goal with water management is not to manage for good livestock forage, but to manage for nesting cover, wildlife foods and late season brood water. Our water management practices have changed so that we are now holding water on fields longer than we have in the past. This is discouraging grasses such as creeping wildrye and Nevada bluegrass and encouraging more water tolerant plants such as sedges, rushes and spike rushes.

**** Why is the refuge keeping the water level so high at the Double-0? I am concerned about washing out dike; I feel Silver Creek water should not be moving south; It appears that all the good grass is being killed by keeping the water level so high.**

Water levels at the Double-0 Unit were kept somewhat higher than ideal during spring 1993 because of the extensive flood runoff. We agree shallow depths are best for the widest variety of wildlife.

**** How will water be managed differently in the next five years?**

Water management will involve some minor changes. More late season brood water for ducks and geese will be maintained through September. Water will be drawn down in some areas to provide habitat for migrating shorebirds in early July. In certain meadow areas important for nesting cranes, water levels will be reduced to encourage moist-soil habitat for crane broods.

**** I am concerned about Double-0 water rights.**

Water rights are also a major concern for the refuge. Our Regional office water rights staff is working to make certain that we are using all our rights in accordance with state permits. As we continue to research our water rights, we will be looking to resolve any issues which are in conflict with our wildlife objectives.

**** Why is the Peterson dike so high??**

This dike was constructed to slow run-off from the north portion of the unit to provide wetland habitat for birds. The dike spillway needs to be enlarged so that water doesn't back up so deep.

**** Why is it not always possible to maintain water in semi-permanent marshes through September and how is this related to the irrigation system?**

Lack of water, especially during dry years, makes maintenance of water in refuge wetlands difficult during late summer and early fall.

****"Water level manipulation is a useful technique for enhancing waterfowl production, but conceivably these manipulations could conflict with level changes that would benefit migrant shorebirds."**

Our annual water management plan for the Double-0 Unit will prescribe water management to benefit shorebirds in certain important shorebird nesting and use areas (e.g. drawdowns for migrants) while also prescribing water regimes to benefit waterfowl and enhance production.

****"How does 'dewatering' differ from 'draining'?"**

These terms are synonymous.

<u>Wildlife Management</u>

****Why is the refuge bird population down?**

This question depends on which species of birds is being looked at. Some species are at or near record levels. Breeding ducks have remained relatively stable for the past thirty years while migrant populations have been at low levels due to many factors including low continental populations and low food supplies on the refuge because of carp.

**** I am concerned that the specific mission of the Malheur Refuge does not specify management of breeding sandhill cranes thus making haying, grazing and predator control unnecessary. ** Your concern for the sandhill cranes is in order to continue cattle**

grazing on the refuge.

The Double-0 Unit was purchased with funds from the Migratory Bird Conservation Committee. These funds are used to protect and manage migratory birds and other wildlife throughout the United States. Sandhill cranes which nest on Malheur are part of the Central Valley Population of sandhill cranes. These birds are listed as "endangered" in Washington State, "threatened" in California and sensitive in Oregon. These cranes were identified as a management priority in the Malheur Refuge Master Plan.

Our concern for the cranes relates to their tenuous status and the Service's responsibility to keep this population from becoming federally listed.

****"Is early nesting beneficial?" "Why do you see early nesting as a benefit?"**

Some advantages of early nesting include: greater chances of renesting if eggs are lost, avoidance of problems with water shortages for broods, avoidance of increasing coyote activity in late summer, and more time to grow and gain strength for migration.

**** What wildlands are on the Malheur Refuge and should some lands revert to wildlands?**

Other than fencing for protection from livestock, no active management occurs on about 60% of the refuge and thus these areas are essentially wildlands. These areas include Malheur, Mud and Harney lakes and portions of the Double-0 and Blitzen Valley units. Although about 40% of the refuge has been modified by developments, these areas primarily support native plant communities. These developed areas are particularly important to sandhill cranes because of the wet meadow and marsh habitats that were created.

**** Sandhill cranes being hunted in the Mississippi Flyway could be captured and transferred to Malheur to build the population.**

Cranes hunted in the Central Flyway (not the Mississippi Flyway) are primarily lesser and Canadian subspecies, while those at Malheur are greater sandhill cranes. We do not believe it would be wise to mix these populations. Also, wild birds would have a great desire to return to their natal areas and would not likely remain in our area.

**** Could you estimate what you think would happen to wildlife values, other aesthetic values, reproductive success, population densities, and related values if you eliminated cattle and internal fencing from the Double-0 Unit?**

Generally, aesthetic values would be improved with elimination of cattle grazing and fencing; however, aesthetics is a personal viewpoint and some people feel cattle are aesthetic. Elimination of all internal fencing would eliminate fence-related wildlife mortalities. Elimination of all cattle grazing would reduce the attractiveness of the Double-0 Unit to spring migrant waterfowl and sandhill cranes, resulting in reduced use of the refuge and more dependence on private lands, unless the area was hayed or burned. We can not accurately predict the effects of eliminating grazing and fences on wildlife reproductive success, wildlife population densities, and related wildlife values.

****"What 'important needs of wildlife species will not be met' without 'active management of these habitats'?"**

Without active water management, many artificial wetland areas in the unit would not receive water and would not provide feeding and nesting areas for cranes, shorebirds or waterfowl. Without treated meadows to serve as early spring feeding sites where birds can accumulate protein for the nesting season, it is possible that nesting will be delayed for some species and that the area will not attract as many breeding pairs. Shorebirds in particular need sparse or short vegetation for nesting. Burning, haying and grazing can enhance habitat for nesting shorebirds.

Fisheries Management

****I am concerned about native fish.**

Native fish are an important part of the biodiversity at the refuge. Unfortunately, many of our native fish such as chubs and red-banded trout have been impacted by exotic carp populations. Removal of carp from the system will improve habitat conditions for both waterbirds and native fish.

What data is available "supporting the idea that carp are serious inhibitors of wildlife productivity at Malheur NWR"?

Malheur Refuge duck production, waterfowl use, duck pair, colonial waterbird pair count, and aquatic plant data all support the idea that carp are serious inhibitors of wildlife at Malheur.

"Carp control has never worked. What kind of control program is it that provides such a temporary reduction in the 'pest' population? Any scheme to poison carp must be preceded by an analysis of potential effects on non-target species."

Although past efforts towards carp control have not eliminated carp from the area, they have resulted in increased wildlife values and have not to our knowledge caused the significant loss of any endemic species in the area. We are concerned about non-target species and have considered them in past control efforts. We will plan future control efforts to minimize impacts to them.

D. Attendees

NAME	AFFILIATION
Glen Ardt	Oregon Department of Fish and Wildlife
Forrest Cameron	USFWS
Joel David	USFWS
Bill Evans	Izzak Walton League
Cal Elshoff	Central Oregon Audubon
Craig Foster	ODFW
Jim Houk	USFWS-Portland Office
Joe Hendry	Interested Citizen
Gary Ivey	USFWS
Jim Lemos	ODFW
Gary Marshall	Refuge Permittee
Don Miller	Refuge Permittee
Geran Moon	Refuge Permittee
John O'Conner	USFWS
Eric Scheuering	Interested Citizen
Dan Sherman	Interested Citizen
Marty Vavra	Eastern Oregon Agricultural Research Center
Louis & Doris Yriarte	Refuge Permittee

APPENDIX II.

IMPORTANT WILDLIFE SPECIES' NEEDS

Wildlife to be emphasized in management of Double-0 habitats include nesting and migrating shorebirds, sandhill cranes and ducks. Although these are not the only species which will benefit from management of the unit, they are priority species, as prescribed by the refuge's Master Plan. By serving the needs of these species, the needs of other wetland wildlife will also be met. The basic needs of these species, in relation to management of the Double-0, are described below:

A. SHOREBIRDS

Nesting shorebird species found in the Double-0 Unit include snowy plover, killdeer, black-necked stilt, American avocet, willet, Wilson's phalarope, spotted sandpiper, long-billed curlew, and common snipe. Most species of nesting shorebirds select very short cover or barren sites for nesting. They feed intensively on invertebrates, such as insects and crustaceans, in wetlands and along shores of lakes and ponds.

Migrating shorebirds arrive from April through mid-May during spring migration, and from mid-July through September during fall migration. These birds utilize shallow water areas, shorelines and mudflats as feeding sites. Habitat management to meet their primary need for food includes providing bare shorelines, shallow water and mudflat habitats. Some of these habitats are naturally created. In the spring, alkali playas fill with water and crustacea flourish. In late summer, many of the area's wetlands naturally decline to expose mudflat areas for feeding. These conditions can be enhanced by planned drawdowns of certain wetlands, and by providing irrigation water to playa areas at appropriate times.

Foster (1985) studied habitat selection by nesting birds in fields in the northern portion of the Double-0 Unit. With regard to nesting shorebirds, he stated that "in all cases, shorebirds used shorter and lighter vegetation than ducks." Shorebird nests were found almost exclusively within bluegrass-wildrye vegetation associations, which were predominant in the North Stinking Lake Field, the Peterson Field, north of the east-west dike, the Plow Field, and portions of the South Stinking Lake Field. In the North Stinking Lake Field, he found high densities of nesting ducks under idle management, and high densities of nesting shorebirds under rake-bunch grazing management. He recommended using grazing or mowing of hay in certain short-grass habitat types to provide favorable conditions for nesting shorebirds.

Helmers (1992) provides management recommendations for shorebirds. For spring migrant shorebirds, he suggests fall flooding of areas about one month before freeze-up to allow aquatic invertebrate populations to develop. For summer migrants, he suggests wetland drawdowns to make aquatic invertebrates available, and also recommends flooding some new areas 2-3 weeks before shorebirds arrive. For nesting shorebirds, he suggests the use of burning, mowing or livestock grazing to enhance conditions for nesting.

B. CRANES

Sandhill cranes use the same territory year after year. They usually nest in marsh vegetation and rely on meadow habitats for feeding and raising their young. Intensive land use treatments such as burning or rake-bunch grazing of meadow habitat within crane territories appears to stimulate earlier nesting than less intensive land management strategies.

Sandhill cranes may initiate nesting as early as mid-March, although most nests are initiated in April and early May. A few nests are initiated in late May, and these late nests probably reflect renesting attempts by some pairs who lost their original nest. Depending on when they are initiated, nests hatch from late April through early July. Young cranes require moist soil conditions and some water throughout their brood rearing period, which lasts approximately 70 days. Most young are fledged by early August, however, some young, which later, may not fledge until mid-September.

Cranes initiate nesting when their territories are adequately flooded and the females have consumed enough protein to begin egg laying. Cranes nest earlier in fields that are irrigated early and later in fields that are flooded late. Nest initiation is also affected by land use treatments. Treatments which remove ground cover (burning, grazing, haying) result in earlier soil warm-up and availability of protein-rich invertebrate foods. Cranes nest earliest in burned areas, followed by mowed and grazed areas, and nest latest in idle areas (C.D. Littlefield, pers. comm.).

Littlefield (1968) outlined three essential ingredients for a crane nesting territory; a feeding meadow, nesting cover and water. Territories average 43 acres at Malheur Refuge and contain irrigated meadow for feeding and flooded marsh nesting cover. An ideal territory contains a shallow marsh with residual emergent vegetation in close proximity to foraging meadows.

Of the 1200 crane nests located and monitored at Malheur Refuge since 1966, 92% were located in marsh habitats. Most nests were constructed from marsh vegetation as floating platforms over shallow water. Burreed accounted for 43% of all nests sampled, followed by hardstem bulrush (34%), and cattail (6.3%). Average water depth at nests was 25.2 cm while vegetation height at nests

averaged 34 cm. The average distance of nests from open water was 25 m and the average distance of marsh nests from meadow habitat was 44 m (Littlefield, unpubl. data). Nests were typically located in small (1-10 acres) seasonal marshes. Nest success was highest in hardstem bulrush, presumably because it provided the greatest security from predators due to deeper water and better concealment.

Only 8% of the crane nests documented on the refuge have been in meadow vegetation. The primary importance of meadows to cranes is for feeding as well as brooding young. Generally, cranes are attracted to intensely treated meadows (mowed, burned or rake-bunched grazed) for feeding during early spring. These intensive treatments remove ground cover, allowing solar radiation to warm the soil, causing earlier greenup of vegetation and earlier invertebrate availability.

Radio telemetry studies of young cranes conducted on the refuge (Littlefield 1985) showed that the wet meadow zone adjacent to uplands is a preferred area for crane chick brooding. This preference is assumed to be associated with invertebrate abundance and availability.

Sandhill Cranes need water applied to their territories early in spring (by mid-March) to provide moist soil areas for feeding. Ideal water management for cranes feeding in meadows would provide areas ranging from moist sub-irrigated to water depths of 10 cm. They continue to need some water within their territories until chicks fledge, which may be as late as mid-September. They use open water areas within marshes for night roosting and as loafing sites during the day. During the breeding period (March through August), cranes rely on roosting sites within their territories. Outside of the breeding season, they use large communal roosts at night, usually in open water areas of ponds at least 20 acres in size. They will use smaller marshes for loafing during mid-day.

Cranes are omnivores, eating a variety of plant and animal foods. During spring, cranes consume plant tubers and rootstocks which are high in protein as well as invertebrates such as earthworms and beetle larvae when these foods become available. During the breeding season, adult cranes require high protein foods to carry them through the nesting period. They primarily feed in irrigated meadows, using marshes and grainfields to a lesser extent.

Cranes will prey upon small rodents, young birds, and eggs, although these are not major food items. Young cranes also require high protein diets for rapid growth, and primarily consume invertebrates such as earthworms and insects. As they grow, they feed more extensively on plant items such as seeds. Before migration in the fall, sandhill cranes rely on carbohydrate-rich foods, such as cereal grain crops, to build fat reserves to be stored as energy for migration. Because most

private grainfields in the area are hunted for waterfowl and upland game birds, cranes abandon them as feeding sites. Providing grain crops in the Double-0 Unit would be beneficial to the population by providing a food source in an area where hunting is not allowed.

The major factor limiting crane production in recent years has been depredation of eggs and young. The most important predators of crane eggs were common ravens, while major predators of young cranes include coyotes and mink.

1. Desired Habitat Conditions For Sandhill Cranes

Irrigation should begin in meadows and marshes in early February, before the cranes' spring arrival, and all breeding territories should be wet by mid April. Water should be widely distributed throughout all crane habitat to minimize territorial conflicts. Water level fluctuations should be minimized during the nesting season to prevent flooding or stranding of nests.

Cranes should be encouraged to nest early when possible, to avoid problems with water shortages for brooding colts during summer, and increased coyote activity in late summer. Therefore, crane territories should be irrigated as early as possible, and intensive land use treatments such as burning, haying and rake-bunch grazing of areas within crane territories should be used because they appear to stimulate earlier nesting than an idle land management strategy.

An optimum crane territory should contain 5-10 acres of emergent vegetation interspersed with 20-30 acres of moist meadows. The average territory size at Malheur Refuge is 43 acres (C. D. Littlefield, pers. comm.).

For nesting, erect emergents (1-2 acres minimum) with an average vegetation height at the nest of 35 cm is desirable. Nest cover should provide enough concealment so at least two sides of the nest are visually obscured by vegetation.

The optimum brooding habitat consists 5-10 acre emergent stands interspersed with 20-30 acre moist meadows. The moist ecotone between uplands and wetlands is a favored feeding area for crane chicks. Moist feeding meadows should be maintained through September 15.

C. DUCKS

The four most common duck species which nest in the Double-0 are cinnamon teal, mallards, gadwall and redheads. Factors limiting duck production primarily relate to habitat quality and availability, and depredation. Ivey and Paullin (1985) provide a detailed discussion of these limiting factors.

1. Food

Ducks use a wide variety of foods throughout the year, and readily take advantage of available foods which meet their nutritional requirements at different times of the year. Generally, plant foods are utilized more during the fall and winter period when ducks need a lot of energy for migration, while animal foods, particularly aquatic invertebrates, become very important during spring and summer when demands for protein for egg-laying, molting and growth of ducklings are high. Ducks need high quality wetlands which contain an abundant, high-protein food supply early in spring to prepare their bodies for the demands of egg-laying. During courtship, birds must accumulate protein-rich food reserves to carry them through egg-laying and nesting. Aquatic invertebrates from marshes and wet meadows meet this requirement for most species. The better the body condition of nesting hens, the higher their production. Hens in poor condition are less attentive to nests and broods because they must spend more time feeding to meet their own needs.

2. Pairing And Prenesting

Because breeding ducks are territorial, the greater the wetland area, the more pairs a unit can support. Marsh and wet meadow habitats are used extensively during courtship by waterfowl. They accommodate general needs of these species by providing food, cover, water, and also meet the specific needs of individual species (i.e., providing loafing sites and territorial space). Availability of food appears to be of primary importance to courting ducks.

Maximum pair habitat is created where small areas of open water, less than one acre in size, are separated from other similar openings by visual barriers. The number of duck pairs a wetland can support can be optimized by providing hemi-marsh (50:50 emergent vegetation to open water ratio) conditions (Kaminski and Prince 1981, Murkin et al. 1982). The number of water areas per square mile is more important in determining waterfowl pair densities than the total wetland acreage per square mile (Stoudt 1964).

Kantrud and Stewart (1977) found seasonal marshes, followed by semi-permanent marshes, to be most important to dabbling duck pairs; while semi-permanent marshes, followed by permanent marshes, were most important to diving duck pairs. Suchanek (1980) found that cattail edge negatively influenced dabbling duck pair use and diversity and, conversely, attracted diving duck pairs. Seasonal marshes should have 70-90% open grassy shorelines to be optimum for dabbling duck pairs (A. Kruse, pers. comm.). Duck pairs use wetlands that have been treated (burned, grazed, mowed) earlier in the season than wetlands with idle vegetation. Theoretically, treated areas receive more solar radiation, and therefore these soils warm much earlier

than non-treated areas, resulting in earlier plant growth and earlier availability of invertebrate foods. The new plant growth and invertebrates are important sources of protein, needed by breeding waterfowl and other birds for egg laying as described by Eldridge and Krapu (1988).

Based on preliminary analyses of spring duck use data collected from 1988 to 1990 at Malheur Refuge, duck use was higher on more intensively treated sites (Table 2). The data also suggests that ducks shift their use of areas throughout the spring to take advantage of rich feeding areas, shifting from the most intensively treated wetlands early, to non-treated wetlands late in the breeding season.

Optimum conditions for mallards occur when water is shallow, flooded 20-30 days before the peak of nest initiation (Dzubin 1969). It is assumed this principle holds true for most duck species. Mallard pairs need seasonal wetlands flooded by mid-March to establish their territories and begin nesting. If we can meet the water needs for mallard pairs, all other dabbling duck species' needs should be satisfied. The greater the acreage of wetlands flooded in time for early mallard use, the greater the breeding population the Double-0 Unit can support. Irrigation water needs to be applied as early as possible in spring, and some areas should be flooded and maintained through the fall and winter to ensure that adequate wetland habitat is available for duck pairs.

Optimum conditions for waterfowl in the Prairie Pothole Region are assumed to exist when a minimum of 150 optimum wetlands account for a minimum of 160 acres per square mile (Sousa 1985). The greater the number of small ponds (dugouts, etc.) that we can provide in the Double-0 Unit up to this density, the more dabbling duck pairs we should be able to support. Providing a good diversity of treatments of various types and intensities, as well as non-treated areas, should enhance feeding conditions for breeding dabbling ducks.

Deep, open marshes and lakes which contain an abundance of submerged aquatic plants are most attractive to redhead pairs (Low 1945, Lokemoen 1966). Semi-permanent wetland types, typically flooded throughout the year, meet their needs. To reinvigorate productivity and facilitate carp control, periodic drawdowns are necessary.

Table 2. A Preliminary Summary of Data Collected from Paired Plots of Different Landuse Treatments for Spring Use by Ducks and Geese in the Blitzen Valley, 1988 through 1990 (Ivey, unpubl. data).

YEAR	TREATMENTS COMPARED	PRELIMINARY RESULTS
1988	PB vs. RBG	Duck use was 2.3 times greater on PB
1988	PB vs. GO	Duck use was 13 times greater on PB
1988	PB vs. RBG	Duck use was 1.4 times greater on PB
1988	PB vs. RBG	Duck use was 1.7 times greater on PB
1989	HO vs. RBG	Duck use was 1.5 times greater on RBG
1989	HO vs. RBG	Duck use was 1.4 times greater on RBG
1990	RBG vs. ID	Duck use was 3.1 times greater on RBG
1990	PB vs. ID	Duck use was 7.5 times greater on PB
1990	HO vs. ID	Duck use was 1.5 times greater on HO

RBG = Rake-bunch graze PB = Prescribed burn GO = Graze only
HO = Hay only ID = Idle

3. Nesting Cover

Quality of duck nesting habitat can be negatively impacted by land-use practices which remove cover, making it less suitable for use by dabbling ducks. Untreated idle areas may eventually lose vigor and structure and become less attractive to nesting ducks over time. Early nesting species such as mallard, pintail, and cinnamon teal, rely heavily on residual vegetation from the previous year for nest cover. Late nesting species such as gadwall, redheads and ruddy ducks don't rely on residual cover as much, and often use new vegetation as nest cover.

Several studies have been conducted at Malheur Refuge to evaluate nesting habitat requirements for ducks. Most diving ducks rely almost exclusively on marsh emergent as nesting substrate; while most dabbling ducks rely on upland or meadow vegetation types as nest sites. However, at Malheur Refuge, we have found relatively high duck nest densities in large expanses of hardstem bulrush and burreed.

Bellrose (1976) reported that cover density was a more important requirement for duck nesting than cover type. Density of residual vegetation is an important factor in nest site selection

for dabbling ducks in the Blitzen Valley (Clark 1977, Jarvis 1980). Residual cover, provided by idle management, was most important to early nesting mallards, and was important, to a lesser extent, to cinnamon teal and gadwalls. Refuge fields with residual cover supported greater duck nest densities, higher nest success, and more ducklings hatched than fields which were hayed or hayed and grazed (Clark 1977, Ivey 1979, Jarvis 1980). Nest studies conducted on the refuge by Clark (1977), Ivey (1979), Foster (1985), and Paullin (1989b), have all shown that duck nest densities were consistently greatest in idle vegetation, ranging from 2 to 3 times greater than in treated vegetation.

Foster (1985) studied duck nesting in the northern fields of the Double-0 Unit. He found vegetation density, determined by Robel pole measure of vegetation height at 100% obscurity (Robel et al. 1970), to be the best variable for defining nest site selection. Robel readings for redhead, mallard, gadwall, and cinnamon teal averaged 4.5, 4.9, 4.7, and 3.9 dm, respectively. Because of the predominance of vegetation associations which attract nesting ducks, he recommended the Redhouse Field and the southern portion of the Peterson Field be managed as idle.

Higher duck nest densities can be expected in broken versus solid stands of marsh emergent (Kantrud 1986). Murkin et al. (1982) found more mallard nests on small islands of emergent in experimental plots where 50 to 70% of emergent cover was removed (thus, 50:50 and 30:70 cover-to-open-water ratios) than on plots where only 30% of emergent cover was removed (70:30 ratio). Enright (1971) found higher mallard nest densities in residual meadow habitat which was artificially broken up by mowing.

At Malheur Refuge, Jarvis (1980) found that mallard nests were most often located in dense residual cover in upland habitat, while both meadow and marsh sites were also important. Marsh and meadow nests were in dense cover as well. Mallards, of all the dabbling ducks, use marsh emergent most often for nesting. Gadwall nests were located in both upland and meadow sites in equal proportions. Gadwalls generally prefer dry sites for nesting and are known for their affinity to islands (Duebbert 1966). Gadwalls often choose nest sites containing annual forbs such as nettle or thistle. Cinnamon teal nests were primarily located in meadow habitat, with upland areas being of secondary importance on the refuge. They generally preferred grassy nest sites and avoided brushy areas.

Cover removal, regardless of the method, generally delays nest initiation and lowers overall duck nest density. For early nesting species like mallards which rely on residual cover, it was found that the higher intensity the treatment, the later the average nest initiation date. In treatments which remove cover, ducks delay nesting until adequate cover (new growth) develops. Because redheads and gadwalls nest so late, land use practices which occur in fall or winter do not appear to affect when nests are initiated. Low (1945) observed no ill effects on nesting or nest cover of redheads due to livestock grazing. Burned marsh

vegetation generally doesn't grow soon enough during the nesting period to receive much use by nesting redheads.

Dense blocks of emergent vegetation, greater than 10 meters wide, should be maintained throughout seasonal and semi-permanent marshes for over-water nesting redheads. In the Double-0, baltic rush is the dominant emergent nesting material used by over-water nesting diving ducks. Large blocks of emergent nesting habitat should be interspersed with small open water areas. Nesting marshes should be within a quarter mile of larger, more open pairing and brooding marshes.

Nesting cover should be interspersed among wetlands, and also among various vegetation treatments. Upland sites with high potential for producing good nesting cover should be maintained in good condition for mallards and other upland nesters. Areas of vigorous idle meadow, providing good structure, should be maintained for meadow nesters such as cinnamon teal. Large cover blocks of 50-100 acres should be maintained to ensure higher nest success. Dense emergent areas, greater than one acre in size, should be maintained throughout seasonal and semipermanent marshes for over-water nesting. In hay and graze areas, blocks of unhayed meadow containing 10-30 acres should be left to provide nest cover for meadow species. In hay-only areas, a buffer strip of meadow of about 30 meters should be left adjacent to uplands, and blocks of unmowed meadow should be left in fields which lack uplands.

4. Broods

Duck broods require productive wetlands which are high in aquatic invertebrates, with escape cover to protect them from predators, and safe loafing sites for brooding. Broods prefer semi-open or open marshes (Kantrud 1986) which are seasonal or semipermanent (Duebbert and Frank 1984). Mack and Flake (1980) observed that broods appeared to prefer hardstem bulrush and avoid cattail.

Growing ducklings require high protein foods and primarily feed on aquatic invertebrates. They need both open water and emergent cover to escape predators. Seasonal and semipermanent marshes are most important to broods (Duebbert and Frank 1984), and broods prefer semi-open or open marshes (Kantrud 1986). Brood marshes should be in hemi-marsh condition, when possible, to provide good emergent cover and should also contain excellent beds of aquatic plants for food. Generally, the greater the habitat quality, the more broods the habitat can support (Patterson 1976); however, overcrowding of broods on an area can lead to increased duckling mortality, primarily because ducklings get separated from their hens due to increased numbers.

Because redheads and gadwalls are such late nesters, the impact of late season water shortages for broods is great on these species. Brood marshes should be maintained as semi-permanent marshes, with water held at least through September whenever

possible. In dry areas, where brood water is in short supply, brood ponds larger than 20 acres should be constructed along primary irrigation facilities so they can be easily maintained.

The effects of land use treatments on duck broods at Malheur Refuge have not been studied. Water management is much more important to duck broods than the traditional vegetation management treatments at Malheur. Vegetation treatments can impact duck broods when they lead to reduced surface water habitat during the brooding period. For example, draining of refuge fields to allow mowing of meadows is generally detrimental to duck broods, and particularly to redheads, because of their late brood water needs. Based on refuge records, 85% of all redhead broods are fledged by September 15th, but only 15% are fledged by August 15th. These losses of wet areas cause a reduction in feeding habitat and force broods to move to other wet areas, thereby exposing them to predators and other hazards which increase brood mortality.

Broods need high quality wetlands containing an abundance of food to meet their protein demands for rapid growth. They need both open water and emergent cover to escape predators. Species like mallards and cinnamon teal rely on seasonal wetlands for raising broods early in the summer, while redheads and gadwalls rely more on permanent wetland types for their broods later in the summer. The number of ponds with late summer water for broods is an important factor limiting duck production in the Double-0 Unit.

For optimum duck brood habitat, four or more suitable marsh areas (from 2-20 acres each) should be available in each square mile of the Double-0 Unit. Brood marshes should be maintained through early October when possible. In dry areas, where brood water is in short supply, brood ponds larger than 20 acres should be constructed (at least 3 per section). Any new brood ponds should be connected directly to a water delivery system to maximize efficiency of water management. Brood marshes should be in hemi-marsh condition when possible and should contain excellent beds of aquatic plants.

5. Water

The amount of wetland habitat available for pairs, broods and molting ducks is dependant on water supplies from the Double-0 springs, which are very dependable, and on Silver Creek run-off, which is very unreliable. Water for brood habitat is in short supply in most years, and not enough brooding areas have been developed to meet the needs of duck broods in the Double-0.

During the nesting period, water level stability is critical to over-water nesters such as the redhead. Rising or falling water levels can cause nest failure due to flooding or stranding, which leads to nest abandonment.

6. Depredation

Depredation of nests and broods by predators has been a significant factor limiting duck production on Malheur Refuge (Ivey and Paullin 1985). Common ravens, coyotes, raccoons and mink are all important predators which have lowered production. In general, depredation losses on diving duck nests have been less than dabbling ducks due to increased isolation of their over water nests from terrestrial predators such as coyotes. Depredation is often influenced by wetland conditions, particularly as dropping water levels make nests and broods more readily accessible to predators.

APPENDIX III.

HABITAT MANAGEMENT STRATEGIES

A. HABITAT TOOLS

Vegetation management tools such as livestock grazing, mowing and prescribed burning are used to improve or maintain habitat needs of refuge birds and other wildlife. Most grasslands, if left undisturbed for too long, become less productive and begin to lose necessary attributes for certain wildlife species (Duebbert et al. 1981). A discussion of the use of these tools in different habitats is presented below.

1. Livestock Grazing

There is no wildlife benefit in using livestock grazing to manage upland or woody riparian communities. Grazing of shrubsteppe habitats (sagebrush and greasewood) generally leads to an increase in woody vegetation and a decrease in grasses, while fire generally results in the opposite effect (Mack and Thompson 1982). Livestock often damage these areas by reducing the amount of vegetative cover. Therefore, this tool is not compatible with wildlife objectives for these habitats. Areas containing significant acreage of upland or riparian habitat are excluded from consideration for livestock grazing. Areas along natural stream courses will also be protected from grazing.

Numerous studies of cattle grazing in waterfowl production habitat have been conducted over the past forty years. There are many detrimental effects described in the literature which are caused by cattle grazing. Some of the more common resource related problems are listed below:

1) puddling of soil (Griffith 1964) and decreased water.

2) dike and levee degradation (Chabreck 1968).

3) increased water turbidity resulting in decreased submerged aquatic plant production (Low and Bellrose 1944; Chamberlain 1948; Jan and Hunt 1964; Bue et al. 1964).

4) competition with waterfowl for food resources (Chabreck 1968. Gjersing 1975).

5) undesirable changes in vegetative composition that favor non-palatable or weedy species (Bennett 1938, Bue et al. 1952, Griffith 1964, Chabreck 1968, Vallentine 1990).

6) decreased carrying capacity for duck breeding pairs (Bue et al. 1964, Drewien 1968, Kirsch 1969, Smith 1971).

7) decreased nest densities (Sowls 1955, Mihelsons 1968, Kirsch 1969, Nelson 1972, Clark 1977, Ivey 1979, Jarvis 1980, Foster 1985, Paullin 1989b).

8) decreased nest success due to increased predation, trampling, or abandonment (Lynch et al. 1963, Capel 1965, Evans and Wolfe 1967, Duebbert 1969, Kirsch 1969, Miller 1971, Nelson 1972, Clark 1977, Ivey 1979, Jarvis 1980, Foster 1985, Paullin 1989b, Littlefield and Paullin 1989b)

9) increased soil erosion by wind, water and gravity (Stoddart et al. 1975).

10) decreased carrying capacity for duck brooding (Gjersing 1975).

11) in general, vegetation diversity decreases as grazing intensity increases and this has a direct effect on the distribution and diversity of wildlife (Carpenter 1984).

12) aesthetic issues such as the visual impact of a large number of cattle in wildlife areas, extensive fencing on public lands, concentrations of dung and insects, and destruction of springs, fishing sites, streambanks and trails by livestock (Kirby et al 1992).

To summarize, Braun et al. (1978) reported that at least 55 waterfowl studies have shown livestock grazing to be detrimental to waterfowl production and only one study (Burgess et al. 1965) reported higher success of nesting ducks on moderately grazed areas than on idle lands.

Most of the studies cited above dealt with grazing during the duck breeding season, a time when direct conflicts between the needs of cattle and ducks can be great. At Malheur, cattle grazing is conducted as a fall-winter program, so livestock are not present during the breeding season and impacts of the grazing program on breeding waterfowl and other wildlife are indirect.

Some advantages of dormant season livestock grazing of meadows include:

1) intensity of the treatment can be regulated.

2) it can provide habitat diversity and patchiness, particularly in areas of higher precipitation (Ryder 1989).

3) most of the nutrients removed by grazing are kept in the field via animal excreta.

4) cattle dung hosts invertebrates which are utilized by wildlife as food.

5) it can be used under a variety of water level conditions.

6) stimulates early growth of new vegetation which serves as an important food source for some nesting birds.

Grazing in marsh habitats can improve interspersion of water and vegetation. However, this is difficult to achieve without grazing during the growing season, when there would be a direct conflict between cattle and breeding birds. Dormant season grazing within these habitats can modify vegetative structure and reduce the cover potential of emergent plants. Because marsh emergents are not palatable to cattle during the fall and winter, the major impacts on vegetation are due to trampling and bedding, which usually does not drastically alter habitat quality.

Rake-bunch grazing is the most common grazing practice at Malheur Refuge. This is done by allowing permittees to mow meadow vegetation for hay and rake it into wind rows. This hay is eaten by cattle during the fall and winter grazing period.

Dormant season livestock grazing of meadow habitats removes cover. This allows the meadows to receive more solar radiation, resulting in early warming of soils, and earlier availability of green vegetation and invertebrates as food. Treated meadows at Malheur Refuge generally support high waterfowl, shorebird and crane use during the early spring, and provide important high-protein foods needed by these birds to initiate egg laying.

A study of Malheur Refuge land use in relation to spring waterfowl use was initiated by refuge biologist Ivey in 1988 (Malheur refuge, unpublished data). Paired plots of different land uses were established and waterfowl were counted weekly during April and May. Additional plots to compare rake-bunch grazing and idle management were established in 1990. A preliminary analysis of data from these two 800 hectare plots, showed duck numbers to be six times higher in April, and two times higher in May, on the grazed plot than the idle plot. Canada goose counts were 17 times higher on the grazed plot versus the idle plot, and crane counts were 5 times higher. Although these results are preliminary, they support the idea that management of meadows should entail providing a variety of treatments to meet the various needs of migratory birds for feeding and nesting.

Livestock grazing removes cover from meadow habitats and impacts the quality of nesting cover. Several Malheur Refuge studies show that duck nest densities in idle vegetation were 2 to 3 times greater than in treated vegetation. Therefore, it is important to maintain areas of ungrazed meadow to provide for early nesting ducks and other species. Based on past refuge data concerning the number of ducks using the area, managing about half of the Double-0 Unit's meadow vegetation as idle for nest cover will provide ample nest sites for the ducks.

2. Mowing vegetation or "Hay-only"

This tool is generally only applied to meadow habitats, but is used occasionally in other habitats to reduce populations of noxious weeds or to create more open water areas in dense emergent plant beds. Mowed meadow habitat provides benefits for wildlife similar to livestock grazing. Mowed meadow areas support high waterfowl, shorebird and crane use during the early spring and provide important high-protein foods needed by these birds to initiate egg laying.

For the past twenty years, Malheur Refuge has commonly used a treatment called "hay-only", which allows permittees to mow hay in refuge meadows and haul the hay off the refuge for use as livestock feed. This treatment has a major advantage over grazing because the areas to be mowed can be selected to provide good feeding sites while leaving good nesting cover in portions of meadows. Hay-only treatments of meadows eliminate impacts to upland, marsh, and riparian sites. Data from duck nesting studies in the Double-O Unit and Blitzen Valley suggest that hay-only treatments are very attractive to nesting ducks because they accommodate several needs (food, cover, water) within a small area.

One of the biggest detriments associated with mowing meadows is that dewatering is required 10-14 days before mowing to permit equipment access. Such dewatering eliminates brooding, feeding, loafing, and molting opportunities for many of the birds that use flooded meadows. In addition, drawdowns displace broods and molting birds, thus increasing exposure to predators. The earlier the drawdown takes place, the greater the impact to numbers of birds and species involved.

Mowing of meadow vegetation can also result in negative wildlife impacts, caused either by direct contact with mower blades or indirectly by increasing waterbird vulnerability to predators. Mowers are a particular threat to active bird nests and unfledged young. Mowed areas are attractive to certain predators which may prey on young birds.

Table 3 illustrates the breeding chronology of five important bird species based on unpublished refuge data. Most duck nests hatch by mid-August with the broods moving away from the meadows to open water sites. Also by mid-August, about 85% of sandhill crane colts are fledged. However, there is much variation in breeding chronology between years. Birds may fledge earlier or later than the standard dates in any given year. Sandhill cranes, pheasants, some shorebirds, and many passerine birds brood their young in meadows. These birds are particularly vulnerable to mowers.

Table 3. Nest Chronologies of Sandhill Cranes (GSC), Mallards (MALL), Cinnamon Teal (CT), Gadwalls (GAD), and Redheads (RED) at Malheur Refuge, Based on Unpublished Nest Data, 1974-1988.

Date	Percent of Nests Hatched					Percent of Broods Fledged				
	GSC	MALL	CT	GAD	RED	GSC	MALL	CT	GAD	RED
May 1	9.6									
May 15	47.1	3.5	0.3							
June 1	81.7	26.0	3.3		7.3					
June 30	98.0	73.6	75.9	25.3	68.3	1.0	0.7			
July 15	100.0	94.0	95.7	72.3	97.6	14.4	6.7	1.0	6.6	
July 30		100.0	99.7	95.2	100.0	59.6	33.1	21.0	14.5	2.4
Aug. 15			100.0	99.4		85.6	58.8	66.4	47.0	14.6
Sept 1				100.0		98.0	83.4	94.9	88.0	51.2
Sept 15						100.0	97.9	99.0	96.4	85.4
Sept 30							100.0	100.0	100.0	9
Oct. 7										100.

The date on which mowing of refuge fields is begun is a critical factor in minimizing mortality of waterbird populations. The earlier the mowing schedule, the greater the negative impacts to wildlife. To minimize conflicts with breeding birds, August 10 has been selected as the standard refuge mowing date. This date is a compromise between the desire to minimize wildlife losses and the desire to provide open meadow habitat using a low-cost and economically viable tool. The majority of refuge permits will prescribe August 10 as the earliest date for mowing hay. Mowing may be allowed earlier in some fields in order to meet management objectives (e.g. control of noxious weeds). Conversely mowing may be delayed to protect late sandhill crane colts or other species of specific concern.

3. Prescribed Burning

The advantages of fire include: 1) it is a natural ecological process and it generally favors natural plant communities; 2) under proper conditions, it can increase native vegetative diversity; 3) large areas can be treated rather quickly; and 4) a wide variety of wildlife species respond favorably to burns. Disadvantages include: 1) it c be expensive to plan and implement; 2) it can do harm to non-target

areas; 3) clean hot burns can for the short term decrease habitat diversity; and 4) it temporarily removes nesting and escape cover and removes detritus used by invertebrates.

Fire is a natural component of the Great Basin ecosystem. Historical records indicate that fire frequencies have ranged from 32-70 years in the low sagebrush\grass communities (Wright et al. 1979) to as often as 20-25 years (Houston 1973). This frequency is acceptable in uplands with lower potential for nesting habitat; generally those areas where brush is a major component of the site. However, in sites with higher nesting potential, where management for dense, residual, standing cover is the primary objective, burning will likely be required on a more frequent basis.

The native upland plant communities of this region are well adapted to periodic fires. Bunchgrasses such as Great Basin wildrye and bluebunch wheatgrass are stimulated by the effects of fire. Young (1986) found that removal of residual vegetation by burning in a Great Basin wildrye stand had a positive effect on subsequent growth when accomplished during dormancy. He reported a similar effect for many of the other plant species on this site. Blaisdell (1953) reports that big sagebrush is easily killed by fire and that after 12 years there was only a 10% recovery of sagebrush. Hainiss and Murry (1973) found that sagebrush had returned to pre-burn conditions after 30 years.

The use of fire to manipulate emergent vegetation has been discussed by numerous authors (Lynch 1941; Linde 1969; Vogl 1980; Linde 1985; Young 1986). Prescribed burning in marsh habitats can enhance conditions for wildlife by providing more open water areas and protein rich green growth in early spring. However, these results are usually temporary, as nutrients released by fire can result in more vigorous regrowth of marsh plants. Burning in marsh habitats at Malheur is often used to remove vegetation and allow easier access for heavy equipment to achieve repairs on dikes and water delivery systems. Burning can also make it easier for mechanical manipulation (bull dozing or discing) of marsh vegetation to create longer-lasting marsh openings.

Prescribed fires in peat soils can create open water areas in dense emergent stands and usually result in improved habitat for marsh wildlife. These burns require very dry soil conditions and are generally practical only following a long dry period.

Fire effects in meadows have been studied at Malheur Refuge by Young (1986). Burning during fall or winter in marsh or wet meadow areas can make tubers and rootstocks available to swans and snow geese. Burning of meadows creates similar feeding areas in early spring, as do grazing and mowing treatments. Because burned meadows absorbed more solar radiation than unburned sites, burned meadows green up earlier in spring than grazed or mowed meadows.

Emergent vegetation such as cattails and hardstem bulrush continue to encroach upon meadow habitat at the Double-0 Unit.

While continued haying of emergent\meadow borders seems to limit emergent encroachment, dormant season grazing does little to reduce emergent vegetation. Fire can significantly reduce above ground plant material if followed by deep flooding and\or mechanical manipulation (Nelson and Dietz 1986).

4. Water Management

Water is key to wetland habitat management. The timing, duration, depth, and location of water placement are critical factors when providing habitat for wildlife using the refuge. Water management is the major factor regulating the plant communities upon which wildlife depend. Water should be managed to meet the various needs of wildlife in an area. For example, shallow mudflats with 0 to 3 inches water depth are favored by shorebirds, while depths between 3 and 12 inches tend to be favored by dabbling ducks.

Irrigation of wetlands is begun as early as possible, usually by mid-February. Water from both snowmelt and springs in the area is sent via a delivery system to fields and ponds to provide habitat and food for migrating and breeding birds. Water then must be held as long as possible to attract and hold birds through the breeding season. Some areas remain flooded throughout the year.

The duration of flooding in a field or pond affects both water availability and wildlife needs. Water is managed to maintain stable levels during the nesting season to enhance nest success, while other areas remain flooded to serve as brood habitat through September. Because runoff declines by summer, many fields become dry by late July. Wetter fields may be dewatered in late July, to allow for management of vegetation using mowing, grazing or burning. Drawdowns are also used to control carp which may have entered fields or ponds.

Water depths are maintained at various levels depending on species requirements. Optimum water levels for most nesting species are generally less than four feet. Water levels less than two feet provide the greatest diversity for feeding waterbirds. Much of the wetland habitat in the Double-0 Unit is relatively shallow (1 foot or less) and therefore provides good quality nesting and feeding sites.

With regard to sandhill cranes, some areas of the unit have been maintained too wet for crane broods. Young cranes need moist soil areas for feeding. Water management will be modified to meet this need within important crane nesting areas.

B. HABITAT COMPLEXES

Common habitat associations have been developed with corresponding management goals and strategies for the Double-0 Unit. Each field has been classified into one of six habitat complexes based on vegetative associations: (1) Seasonal Wet Meadow; (2) Semipermanent Marsh; (3) Greasewood Upland; (4) Sagebrush Upland; (5) Meadow-Upland Mix; and (6) Woody Riparian.

Management strategies are defined for each of the complexes to provide guidance for development of field prescriptions. A summary of each habitat complex follows.

1. Seasonal Wet Meadow Complex

This complex contains interspersed marsh and meadow habitat flooded seasonally, usually during the growing season. The depth of flooding is generally no more than six to eight inches in meadows and up to several feet in some marsh sites.

Marshes consist of submergent and emergent vegetation within ponds, and emergent stands of bulrush, cattail, burreed or common reed within meadows. Meadows commonly consist of sedges, baltic rush, spike rushe, Nevada bluegrass, and creeping wildrye.

Management of seasonal wetlands will focus on active management of water and vegetation by haying, grazing, or burning of approximately 40-50% of the meadows, while the remaining 50-60% will remain idle. Idle meadow habitat will be burned as needed, generally at ten year or greater intervals, to improve the structure and vigor of the vegetation. No more than 25% of idle meadow habitat will be intentionally burned in any one year.

Marsh sites will be managed for a 50:50 mix of emergent vegetation and open water. This will provide the optimum conditions for the greatest diversity of wildlife. Active management of marshes will consist of water level manipulation, such as periodic drawdowns, to increase productivity of the marsh. Other management activities will include burning, followed by mechanical manipulation (e.g. discing), to open up large dense stands of emergent vegetation.

2. Semipermanent Marsh Complex

This complex contains marsh and pond habitat which is flooded through the growing season. The depth of flooding ranges from several inches to several feet. This wetland complex supports emergent vegetation in the shallower areas and submerged aquatic plants in areas with greater water depth.

Vegetation consists of emergent plants such as bulrush, cattail, burreed, and common reed, and submergent plants such as sago and floating pondweed.

This wetland habitat will be managed to provide optimum food production in the form of submergent aquatic plants and aquatic invertebrates or as moist soil vegetation. For shorebirds, shallow water drawdowns will provide important feeding opportunities. For waterfowl brooding, some larger ponds will be managed for a hemi-marsh condition. Periodic drawdowns and deep flooding are important tools in management of pond vegetation. A gradation of water depths from mud flats to deep water pools will encourage use by a wide variety of refuge wildlife including ducks, cranes, geese, trumpeter swans and mule deer.

3. Greasewood Upland Complex

The Greasewood Upland Complex includes those areas of uplands dominated by greasewood and saltgrass vegetative associations. A common topological feature within this area is open non-vegetated alkali flats. This complex also includes dune\greasewood habitat located in sections of the Martha Lake, Upper Swamp and Hughett Fields.

The management strategy in this complex will be limited to maintenance of existing canals and ditches and sheet flooding of playa sites. Soils in these areas are sensitive to compaction and erosion, and these areas often contain cultural resources. Active management other than water manipulation in these areas will generally not produce any tangible benefits to the wildlife populations using them.

Spring flooding of playas is a common, natural occurrence at Double-0. These flooded playas provide good feeding areas for shorebirds. Small areas of playa (3 acres or less) will be artificially flooded with irrigation water to increase available shorebird habitat.

4. Sagebrush Upland Complex

The Sagebrush Upland Complex includes those areas of uplands dominated by big sagebrush and Great Basin wildrye. These areas are not as extensive as the greasewood upland types at the Double-0 Unit, but are valuable because of the dense nesting cover they can provide.

Management of these areas will be for dense upland nesting cover for species such as mallards, gadwalls and short-eared owls. Idle management will be the main theme for this complex type. On a periodic basis, limited prescribed burning of these areas will be used to promote increased cover and habitat diversity.

5. Meadow-Upland Mix

The upland-wetland mix are those areas where uplands are interspersed with wet meadows and the uplands constitute 20 to

60% or more of the area. Uplands in this complex contain sagebrush or greasewood.

Management of these sites will focus on removal of 40-50% of the wet meadow vegetation for spring feeding and pairing habitat for waterbirds. Uplands will be managed for dense nesting cover. Because uplands are interspersed within meadows in this complex, only haying and burning activities will be considered as management options.

6. Woody Riparian Complex

Woody riparian sites are those areas where willows and associated species dominate. Due to grazing and water management practices over the past century, little riparian habitat remains in the Double-0 Unit. Riparian zones are important to all wildlife, but are of primary importance to passerine birds such as yellow warblers, eastern kingbirds and willow flycatchers.

Management strategies for this complex will concentrate on maintaining existing riparian sites in an idle condition and on promoting expansion of current riparian zones where it is both practical and compatible with refuge objectives. Enhancement of riparian habitat may also be accomplished through the use of plantings.

C. MOWING DATES

One management action that can be particularly disruptive to cranes is early season mowing by permittees as part of their hay operations. Early dewatering to facilitate haying programs reduces the quality and quantity of moist meadow feeding areas. This causes cranes to move to wetter feeding areas. These forced brood movements stress crane chicks and cause increased mortality due to predators, fence entanglement, collision with vehicles and other accidents. Actual mowing activity disrupts normal feeding and movement patterns while also posing a direct mortality threat. Finally, mowing attracts predators, particularly coyotes, which move into mowed fields where hunting for small rodents is good. Crane chicks have commonly "disappeared" shortly after mowing begins and it is believed that many of these are killed by coyotes that are attracted to mowed areas.

To minimize conflicts with breeding birds, August 10 has been selected as the standard refuge mowing date. This date is a compromise between the desire to minimize wildlife losses and the desire to provide open meadow habitat for wildlife using a relatively low-cost, community sensitive approach. The majority of refuge permits will prescribe this mowing date. Mowing will be allowed earlier in some fields in order to meet management objectives (e.g. control of noxious weeds), and may be delayed in order to protect late nesting sandhill crane colts.

APPENDIX IV.
List of common and scientific names used in the Double-0 Habitat Management Plan.

Common Name	Scientific Name
Birds:	
White-faced ibis	*Plegadis chichi*
Trumpeter swan	*Cygnus buccinator*
Canada goose	*Branta canadensis*
Snow goose	*Chen caerulescens*
Cinnamon teal	*Anas cyanoptera*
Gadwall	*Anas strepera*
Mallard	*Anas platyrynchos*
Northern pintail	*Anas acuta*
Redhead	*Aythya americana*
Canvasback	*Athya valisineria*
Ruddy duck	*Oxyura jamaicensis*
Ring-necked pheasant	*Phasianus colchicus*
Greater sandhill crane	*Grus canadensis tabida*
Snowy plover	*Charadrius alexandrinus*
Killdeer	*Charadrius vociferus*
Black-necked stilt	*Himantopus mexicanus*
American avocet	*Recurvirostra americana*
Willet	*Catoptrophorus semipalmatus*
Spotted sandpiper	*Actitus macularia*
Long-billed curlew	*Numenius americanus*
Common snipe	*Gallinago gallinago*
Wilson's phalarope	*Phalaropus tricolor*
Eastern kingbird	*Tyrannus tyrannus*
Willow flycatcher	*Empidonax traillii*
Common raven	*Corvus corax*
Yellow warbler	*Dendroica petechia*
Mammals:	
Coyote	*Canis latrans*
Raccoon	*Procyon lotor*
Mink	*Mustela vison*
Mule deer	*Odocoileus hemionus*
Fish:	
Red-banded trout	*Salmo* sp.
Carp	*Cyprinus carpio*

APPENDIX IV. continued.

Plants:

Big sagebrush	*Artemesia tridentata*
Black greasewood	*Sarcobates vermiculatus*
Bluebunch wheatgrass	*Agropyron spicatum*
Burreed	*Sparganium eurycarpum*
California Plantain	*Machaerocarpus californicus*
Canadian Thistle	*Cirsium arvense*
Cattail	*Typha* spp.
Common Reed	*Phragmites communis*
Creeping wildrye	*Leymus cinereus*
floating pondweed	*Potamogeton natans*
Golden Currant	*Ribes Aureum*
Great Basin wildrye	*Lemus cinereus*
Hardstem bulrush	*Scirpus acuta*
Narrow-Leaved Water Plantain	*Alisma Gramineum*
Nevada bluegrass	*Poa nevadensis*
Perennial Pepperweed	*Lepidium latifolium*
Saltgrass	*Distichlis spicata*
Sedges	*Carex* spp.
Skeleton Weed	*Stephanomaria exigua var. coronaria*
Spike rushes	*Elocharis* spp.
Willow	*Salix* spp.
Sago Pondweed	*Potamogeton pectinatus*
Whitetop	*Cardaria* spp.

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